THE AMERICAN

JOURNAL OF PHARMACY.

APRIL, 1887.

ESSENTIAL OIL PAPERS.

By Albert M. Todd.

1. The Polariscope as a Revealer of Adulterations.

During the month of February last, being the guest of S. P. Duffield, M. D., Ph. D., of Dearborn, Michigan, with whom I was associated in conducting some analyses of spurious oil of peppermint, in behalf of our State, my attention was called by that gentleman to a Mitscherlich polariscope of especial fine construction, made by Desaga, of Heidelberg, and brought to this country many years ago, when the doctor returned from studying with Liebig. That this instrument as an investigator of essential oils is so little known and understood, seems marvelous. The standard and official books to which we refer (pharmacopœias and dispensatories) are entirely silent as to the polarizing test on many essential oils; and when it is mentioned, give only the fact as to the oil being dextrogyre—polarizing to the right, or lævogyre—polarizing to the left, the *angles of polarization*, which are of most vital importance not being referred to.

The reason of this deficiency is probably due to the fact that the authors of our scientific books have not had the facilities for distilling personally the oils under examination; and finding wide variations, owing to impurities, not having certain knowledge which was pure and which not, they were unable to lay down the limits with sufficient closeness.

The immediate cause of our associated analyses was the confirmation of some tests which I had hastily made in court regarding some adulterated essential oils which had been sold to a large extent, the inferior quality of which had been supposed to be entirely due to dementholization—the oil showing that test; but which I found to be chiefly attributable to adulteration with refuse oil of camphor. The oils in

question originated in the city of Detroit, and had been scattered throughout the country to a vast extent, being transferred secretly to agents who represented themselves as the bona fide producers, and the quality as genuine.

As Dr. Duffield kindly extended not only the hospitality of his home, but the use of his laboratory, for the purpose of arriving at more exact conclusions, I took with me a number of samples of my own distillation, besides others with the quality of which I was fully acquainted. The results were that though different pure samples varied in the angle of polarization, there were found to be *limits* beyond which pure samples did not go. In the case of oil of peppermint adulterated with oil of camphor (the latter is dextrogyre, while the former, as is well known, is lævogyre), a most valuable test was found by polarization, especially valuable from the fact that oil of camphor, being so soluble, limpid and volatile, and yielding no distinct chemical reactions had recently become the most dangerous adulterant known, being used to an enormous extent.

Regarding the instrument in question, a description of its construction may be found in Tucker's work on sugar analysis. I will briefly say for those who cannot conveniently gain access to that work, that its practical results are that "an angle of polarization" may be found by carefully revolving an index round a graduated circle, divided in 360 degrees. A "perception tube" (which in the case of this instrument was 200 millimeters in length) is placed between two refracting prisms. The graduated circle is marked off in degrees commencing at a point perpendicular to the centre of the circle. From this point the degrees number both to right and left, meeting at 180 on the opposite or lower side of the scale. The "polarizing angle" is found by filling the perception tube with the oil and turning the index until a point is found to the right or left where the violet and red rays of the spectrum unite *before the 90th degree is reached.* For instance if the red and violet colors of the spectrum unite at the 50th degree to the left, the angle of polarization is said to be —50°, and the oil lævogyre, or "polarizing 50° to the left." It should be observed that this same phenomenon will be also visible to the right on the point *exactly opposite*, which, however, in the case referred to, would be *beyond the 90th degree.*

Now, if it is found that a certain essential oil polarizes within certain limits, if such oil is mixed with another polarizing with entirely

different limits, this difference in the polarizing angle will determine *an adulteration.* And where *dextrogyre* oils are adulterated with lævogyre oils, a most valuable test is obtained in *quantitative analysis,* as well as qualitative, its delicacy being proportioned to the variations between the two oils and the narrow limitations which each has by itself when pure. For instance, if it is found that a certain essential oil always polarizes between —50° and —60° to *the left,* and another oil always between +50° and +60° to *the right,* it follows that there is a difference between these two oils of 100 to 120 degrees; so that if mixed in equal proportions, the angle of polarization would be near zero on the scale.

Now, as to the test in question, five samples of pure Wayne county peppermint oil were examined, which polarized as follows: —55°, —46°, —46°, —52°, —52°, averaging —50.2°. Five samples of natural oil of camphor were also examined, the average of polarization being +65°, making the average difference between the camphor and peppermint oils 115.2 degrees. Five samples of the adulterated oil were now examined, which were found to average —9°, being deficient from the average of Wayne county oil 40.8 degrees. This deficiency as compared to the difference between the Wayne county peppermint oil and the oil of camphor, showed an adulteration of 115.2 : 41.2 or 35.8 per cent.

For the purpose of analyzing the adulterated oils further, I submitted them to fractional distillation in ten fractions, which exhibited great differences in polarization, *seven of these fractions polarizing to the right,* which would indicate more than 50 per cent. adulteration. The fact of a polarizing test showing such a great amount of adulteration may be due to oil of camphor having been exclusively used which polarizes as nearly to zero as possible.

The tests of the adulterated oils, when divided into ten fractions, as to specific gravity, polarization and boiling points are as follows, the oil being distilled in a glass retort with as gentle a heat as possible, over a wire cloth without the addition of water:

No. of Fraction.	Polarization.	Sp. Gr. At 15.5°C.	Boiling Point. Centigrade.
1	+30 (to right)	.9115	182°
2	+29 "	.9145	185
3	+28 "	.9205	188
4	+21 "	.9265	192
5	+17 "	.9315	197

6	+10.5 (to right)	.9385	202
7	+ 1 "	.9444	207
8	— 8.5 (to left)	.9480	211
9	—21.5 "	.9526	214.5
10	None.	.9734	——

When nine full fractions had been distilled, it was found that no more could be recovered, which was sufficiently translucent to admit of polarization. The residuum in the still being of a tarry consistency and quite opaque, distillation was stopped and the residuum drained from the retort, this representing the 10th fraction.

Another feature of the fractions of the adulterated oil is that the specific gravity rises continually with each succeeding fraction, whereas in the fractional distillation of pure oil of peppermint, the specific gravity rises with the first few fractions, *then falls* until a specific gravity is reached, about equivalent to the third fraction, *and then again commences to rise*, this time with increased rapidity. This phenomenon I had the pleasure of calling attention to in the Proceedings of the American Pharmaceutical Association for 1885, page 579.

After an examination of a great number of samples of pure oil of peppermint, collected specially from all parts of the world, I find *but one* sample the *impurity* of which is not established, that polarizes at a less angle than -38°. The *highest* polarizing point obtained in pure oil of peppermint was a sample distilled from plants which I *had dried for six months* before distillation, which experiment is referred to in the September number of *The American Druggist*. This polarized at -74°.

Upon comparing the same oil before dementholization and after, I found the angle of polarization lessened three degrees by dementholization, the amount of menthol extracted being 16 per cent. Pure menthol (being melted, of course, to form a liquid), I find does not polarize distinctly; *but when added to natural oil increases the polarizing angle.* I farther found that the effects of *temperature* on the polarizing angle are very slight, and not (as has been supposed) such as to materially affect the test. For determining this, oils both dextrogyre and lævogyre were used, with the result that for a variation of 115° F. the angle of polarization was changed but three degrees, or but little more than one-fourth of one degree for each ten degrees of temperature; so that experiments made with the polariscope at ordinary temperatures, say from 55 to 75° F., would vary but a fraction of a

degree. In the test of specific gravity such variation in temperature would make considerable difference.

The one single sample of oil of peppermint regarding which I am not satisfied on account of its polarization, was grown in Kalamazoo county, Michigan. It polarized at -29°. Whether this is due to peculiar soil, or some subtle adulteration, is yet to be investigated. Among other notable results, was the test of an oil marked "German" polarizing at —14°, heavily adulterated with oil of pennyroyal and "Japanese peppermint" (Mentha arvensis). Another was the fraudulent brand called "Michigan county oil peppermint," to which I have formerly referred, showing by fractional distillation, 50 per cent. oil of turpentine, and which polarized at —5°. Another sample representing one thousand pounds of dementholized oil, from Detroit, polarized at —38°.

While carrying on the experiments with the polariscope, Dr. Duffield made some most interesting experiments with an optical instrument invented by Prof. Abbe of Germany, named the "Refractometer." This delicate and beautiful instrument arrived at the doctor's laboratory during the week of my visit; he having worked with it recently with Dragendorff at Dorpat, Russia, ordered one constructed for himself before returning home. The determinations of this instrument are based upon the refractive power of a liquid, which is shown on a finely graduated scale, similar to that of the polariscope. This instrument, like the polariscope, is quite expensive and rare in this country. While it requires more skill and care in adjusting and using, its utility consists in the fact that but a single drop of liquid is required.

Through the courtesy of Dr. Duffield, I have been furnished with a table of the "indices of refraction" of many of the samples already mentioned, and the relationship of polarization to refraction will form an interesting subject for future investigation.

Beside the value of the polariscope in determining adulterations of lævogyre essential oils with oil of camphor it is also most valuable in determining adulterations of *oil of erigeron* with oil of turpentine, as the former is lævogyre; also in determining the genuineness of oil of *true fireweed*, for which, heretofore, erigeron oil has been mostly substituted, and for which no chemical test had yet been known, while oil of erigeron polarizes about 50° to the left, the oil of true fireweed (Erechthites hieracifolia) polarizes 44° to the right; consequently those

oils, which heretofore have been difficult to distinguish on account of similar chemical and physical tests, (though varying greatly therapeutically) can now be readily distinguished.

At the request of Prof. J. U. Lloyd, I am now engaged making some special investigations in the oils of fireweed and erigeron, having distilled them in twenty fractions; the results of which may form the subject of another article.

ISOMERIC FORMS OF FERRIC MULTIPLE CITRATES.

By R. Rother.

The market supplies two pretty distinct kinds of normal ferric citrate, as the writer had previously pointed out (Amer. Jour. Phar., Oct. 1885).

It is not implied that these are metameric forms of one another. The ruby tinted kind is simply an impure article which in consequence of extraneous or disproportional admixture, always yields an appreciably smaller product of double salt than is theoretically indicated. But the product as a rule does not materially differ in character from that given by the garnet tinted citrate.

It is well known that elixirs containing citro-salts of iron with cinchona alkaloid salts are extremely prone to discoloration. Neither does this indicate a constitutional transformation of the iron compound. The effect is certainly attributable to the agency of the acidic radicles in perverting the sugar of the excipient, the alkaloid or both. Day light when permitted to obtrude is doubtless also a perceptible factor in the case, and may here be instrumental in reducing the iron to the ferrous state providing no means are present for retaining or reconverting it as ferric salt.

The writer has elsewhere (Amer. Journ. Phar., April 1883) pointed out that the constitutional symbols of the ferric citro-salts are legitimately expressible in alternative forms rationally indicative of metameric products. The writer has succeeded in obtaining at least two well marked compounds of this nature. When for instance one molecule of ferric citrate previously dissolved in water by means of heat, reacts with one molecule of sodium bicarbonate the compound constitutionally symbolized as follows results:

$$(OH)—Fe=Ci—Na \qquad (1)$$

By treating this sodio-ferric hydro citrate with one m. of disodic

phosphate and evaporating the red-brown solution to dryness at a gentle heat a red-brown scaled salt of ready solubility and alkaline taste is obtained. Its empirical formula is $FeNa_3CiPO_4.Aq.$ and molecular weight 427.

If the ferric citrate is first treated with the sodium phosphate and then with the bicarbonate a green solution results which on careful evaporation yields a gray-green scaled salt of ready solubility and alkaline taste. Its empirical expression is $FeNa_3CiPO_4.$ 2 Aq. and molecular weight 445.

The first of these two salts when mixed with elixir of cinchona prepared from the sulphates of the cinchona alkaloids gives after some time a scanty deposite of crystals. The second of the salts when treated in the same way gives instantly a more decided precipitate of minute crystals than the former salt.

As deduced from its manner of generation the constitutional symbol of the red salt may be written

$$Na—Ci=Fe—PO_4Na_2 \qquad (2)$$

and that of the green salt

$$Na_2Ci—Fe=PO_4Na \qquad (3)$$

When two ms. of ferric citrate is treated with two ms. of sodium bicarbonate so as to form the basic citrate already noted above and if this product be then treated with one m. of disodic phosphate a compound results whose empirical formula may be written

$Fe_2Na_4Ci_2PO_4OH.$ Aq. and having a molecular weight of 712.

On first treating the citrate with the sodic phosphate and then with the carbonate an apparently identical result is obtained. From an inspection of the two rationally possible constitutional symbols given by the data in these cases it becomes evident that only one of the structures is chemically possible, as follows:

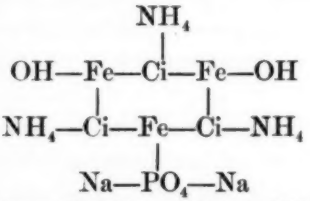
$$\begin{array}{ccc} Fe=PO_4—Fe—OH & & \\ \quad | \qquad\quad | & & \\ Ci=Na_2 \quad Ci=Na_2 & & \end{array} \quad Aq. \qquad (4)$$

The compound has an alkaline taste and renders elixir of cinchona shortly turbid with a crystalline precipitate.

On substituting ammonium bicarbonate for the corresponding sodium salt in this instance evolution of ammonia occurs after addition of the phosphate on warming. As during evaporation ammonia is continually dissipated no determination of the result was made. The

compound gives a scant product of distinct crystals with elixir of cinchona only after several hours standing.

By reacting on three ms. of ferric citrate with three ms. of ammonium bicarbonate and one m. of disodic phosphate a red-brown, readily scaling salt is obtained which may be structurally symbolized by:



(5)

It is anhydrous and its molecular weight is 964. During its course of preparation no ammonia is abandoned as in the preceding case. When mixed with elixir of cinchona no precipitate occurs even after long standing. The structural and chemical possibilities point to an isomeric salt but its production was not attempted.

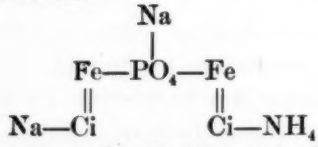
This statement has reference only to the distribution of the acidic radicles in the main group. But when regard is also had to the arrangement of the monad basic radicles a greater number would be possible. In the structural form last given the writer has assumed the retention of all the sodium originally combined with the phosphoric radicle. Yet there is no evident reason for the contrary that half or all is replaced by ammonia radicles.

Elsewhere (AMER. JOUR. PHAR., April 1883) the writer recommended a salt derived from two ms. of ferric citrate, one m. of sodium bicarbonate and one m. of disodic phosphate. On recently substituting ammonium bicarbonate for the corresponding sodium salt a product was found having the empirical formula

$$Fe_2Na_2NH_4Ci_2PO_4.\ Aq.$$

and the molecular weight 667.

The constitutional symbol as deduced from the order of uniting the constituents might be written



(6)

There are a number more of well characterized symbolic forms that could be assigned to this compound independent of the order of mixture.

It would though be a very difficult matter to ascertain the identity of the products. Furthermore the possibilities of transformation by even moderate heat or merely time at ordinary temperatures are so immanent that scarcely any certainty can prevail in this regard. The effects of heat either alone or in conjunction with other agents in the production of metamerism are predominant. It is the writer's belief that metameric states are the result of intramolecular substitution primarily engendered and sustained by heat.

If for illustration in the last formula, the effect of heat should momentarily weaken a ferric radicle either citric radicle might attract the basic residue joined with the phosphoric residue. This action would momentarily strengthen the phosphoric radicle with a tendency to the incidently freer iron. Should the new combination be firmer as regards heat a more permanent compound of the following structure would result:

$$\begin{array}{c} Fe{=}PO_4{-}Fe \\ \quad | \qquad\quad \| \\ Na_2{=}Ci \qquad Ci{-}NH_4 \end{array} \qquad (7)$$

Whatever the intra-molecular condition may be this much is certain that the salt has a very light apple-green tint, a sweet acidine taste, scales finely and does not precipitate elixir of cinchona.

A remarkably small amount of heat often suffices to induce intramolecular change as well as molecular disintegration of chemical compounds ordinarily stable. The writer has elsewhere stated (AMER. JOUR. PHAR., March 1883) that when equal equivalents of ferric citrate and sodium bicarbonate react a hydrocitrate of sodium and iron results. But when two equivalents of the carbonate is added only half the carbonic anhydrate is expelled. The writer has since found that the action of ammonium bicarbonate is analogous. Yet when the two equivalent carbonate solution is evaporated half the ammonia and all the carbonic anhydrate is dissipated whilst the monammonic hydro-citrate

$$OH{-}Fe{=}Ci{-}NH_4 \qquad (8)$$

remains in elegant red-brown scales. When caustic ammonia is added to ferric citrate to saturation two equivalents of the base are absorbed. On evaporating the solution by means of a moderate heat the hydro-citrate just noted only remains. These results show that an excess of free volatile base or its carbonate when added to ferric citrate suffer total expulsion when heated to dryness. A so-

lution of ferric citrate supersaturated with ammonia, on evaporation to a syrupy residue will have parted with the excess of base, but if the supply be maintained till utter dryness two equivalents of it will be retained.

In the process for preparing the official ammonio-citrate of iron all excess of ammonia above one equivalent, if present, is consequently evolved. Hence it follows that the official salt is the hydro-citrate first mentioned. Its empirical formula is therefore

$$Fe\,Ci\,NH_4OH$$

and its molecular weight 280.

When mixed with elixir of cinchona it occasions no precipitate.

Owing to the proneness of green ferrated elixirs to deteriorate in color the writer would suggest the use of hydro-citrates which impart a more permanent and uniform red-brown tint.

For a simply ferrated elixir of cinchona the official ammonio-ferric citrate (symbol 8) is readily applicable. When a phosphated iron is deemed more desirable the hydro-citrophosphate of symbol 5 is suggestive. In such cases where a green phosphated elixir is preferred the compound of symbol 6 would be more suitable than pyrophosphate of iron.

In preparing the ammonio-citrate of iron of the Pharmacopœia the writer would recommend that 272 parts of ferric citrate be dissolved in three or four times its weight of water with heat, 79 parts of ammonium bicarbonate be then added and the solution concentrated and the salt be obtained in scales by the usual method.

For preparing the red phosphated compound for use in elixirs (symbol 5) 816 parts of ferric citrate is dissolved in three or four times its weight of water with heat, 237 parts of ammonium bicarbonate is then added and, when effervescence has ceased, followed by 358 parts of disodic phosphate. The solution will be ready for use when all the phosphate is dissolved. This compound is more conveniently prepared by dissolving 840 parts of the official ammonio-ferric citrate in twice its weight of water and then adding 358 parts of sodium phosphate.

The green phosphated compound (symbol 6) may be prepared by dissolving 544 parts of ferric citrate in three or four times its weight of water, adding 79 parts of ammonium bicarbonate and then 358 parts of sodium phosphate.

NEW COMPOUND VALERATES.

By R. Rother.

There is a considerable number of strictly monobasic acids which generate multiple and acidic salts that are the exact analogues of compound salts derived from polyhydronic radicles. That some mode of chemism not expressible in unit valence binds the molecules together is undoubted. The writer has heretofore in explanation of this state assumed a coalescence dependent upon fractional bonds and preferably assigned this union to the basic rather than the acidic part of the saline compact. But the writer now believes that a more comprehensive view of the case results by assuming a polymerization of the implicated acidic radicle. Thus taking, for instance, a double molecule of chlorhydric acid and representing it by $H_2(Cl_2)$ we may replace half the hydrogen by a quinium residue and obtain acidic quinium chloride $(QuH)H(Cl_2)$ an authenticated salt. When quinine as free base is added in excess to ferric chloride, ferric hydrate is precipitated. On adding chlorhydric acid just sufficient to dissolve the hydrate and then adding quinium chloride as long as combination results a chloride of iron and quinium is obtained which may be represented by

$$Fe(QuH)(Cl_4).$$

When its solution is evaporated spontaneously or with a gentle heat, the double salt remains as a nondeliquescent red-brown amorphous readily soluble mass. On a former occasion (Amer. Jour. Phar., June, 1884) the writer stated that the crystallized ammonium valerate of the market is an acidic salt of valeric acid, but its exact composition was not ascertained. Recently the writer experimented with magnesium carbonate on this compound. From the proportion of carbonate then dissolved it was deduced to be a diacidic valerate having the formula $(NH_4)H_2(Va_3)$. The ammonium and magnesium valerate $NH_4Mg(Va_3)$ thus resulting has an exceedingly sweet taste, free from valeric flavor or bitterness. Its odor is but a faint reminder of its origin. It may be manipulated and exposed with impunity without tainting the atmosphere with the disagreeable aroma of valeric acid. This compound salt is extremely soluble, but can readily be obtained as a nondeliquescent crystalline mass on evaporating its solution to a syrupy consistence. Viewed under the microscope with a half inch objective it is seen to be made up of spinules arranged in star-shaped groups. Its appearance in polarized light is very fine.

This salt is soluble in alcohol in all proportions, but the residue left on evaporation gives no satisfactory appearance under the microscope. When valeric acid is treated with excess of magnesium carbonate in the presence of water a solution of magnesium valerate results. This solution, whether concentrated or dilute, appears to be acted on by the carbonic anhydrate of the atmosphere, as a thin insoluble pellicle of magnesium carbonate soon covers the surface. In consquence the dry salt cannot be secured entirely free from this contamination. Nevertheless the salt gives a very satisfactory appearance with the microscope whilst the polariscopic effect is very pleasing. The crystals have the form of delicate branched wavy filaments emanating from a center. This salt has an all-proportional solubility in alcohol which solution leaves an amorphous residue. This with a half-inch objective and B eye-piece is seen covered with branched, wavy striæ. The alcoholic residue differentiates no colors with the polariscope.

Magnesium valerate forms a compound salt with quinium valerate of extreme solubility in water and in alcohol. The aqueous solution is only stable when highly concentrated, since the addition of water at once precipitates the greater portion of the quinium salt. An aqueous solution containing some alcohol remains intact whether strong or dilute. Such a solution can be heated with impunity during evaporation without separating quinium valerate providing some alcohol is continuously present. Toward the last all the alcohol must be dissipated in order to permit crystallization. The dense residue when left at rest sets to a crystalline mass after some time. But if stirred for a short time after a rather dense pellicle has covered the surface congelation of the whole mass immediately takes place, leaving a perfectly dry salt. Its appearance under the microscope resembles that of magnesium valerate. The writer believes that the formula $(QuH)Mg(Va_3)$. x Aq. represents its composition.

Although magnesium valerate in aqueous solution suffers decomposition on exposure, the compound salts remain unaffected. In the dry state, the compound salts are wholly odorless whilst their solutions have but a feeble valeric odor; owing to their rather agreeable flavor and inobtrusive odor they commend themselves instead of the simple salts. The writer would suggest an elixir of ammonium and magnesium valerate.

Great convenience results from having in stock an aromatized li-

quor for general use in the preparation of elixirs. Such a liquor might be termed an alcarome. In a general way glycerin appears better applicable than sugar as a sweetening for elixirs. The mixture of three measures of alcarome with one measure of glycerin might then be appropriately designated as a glycarome.

The writer prepares alcarome by separating the shells from three drams of cardamom and triturating the grains to a fine powder. One and a half troy ounces of coriander is then also finely powdered. The two powders are then mixed with ten drops of oil of cassia and half a troy ounce of powdered magnesium carbonate. This powder is now added to a mixture of 2 pints of alcohol and 4 pints of water. The whole is set aside for several days, well shaken at intervals, then poured into a filter and the filtrate brought to the measure of six pints by the addition of enough ($\frac{1}{3}$) alcohol through the filter.

To prepare elixir or rather glycarome of ammonio-magnesium valerate, one troy ounce of valeric acid is mixed with 6 fluidounces of water and 125 grains of ammonium bicarbonate. After all the bicarbonate is added and decomposed an excess (about 3 drachms) of magnesium carbonate is incorporated during occasional stirring. One drachm of cochineal is now rubbed to a fine powder and mixed with the solution of the valerates. The mixture is then poured into a filter and when all the liquid has passed down, followed by alcarome until 24 fluidounces of filtrate is collected. To this, 8 fluidounces of glycerin is added and the whole well mixed.

ANTISEPTIC COTTONS AND GAUZES.

By Joseph W. England, Ph.G.

Read at the Pharmaceutical Meeting, March 22.

Pilcher, in his "Treatment of Wounds," from whose work some of the formulas herein given are taken, as there expressed or modified, says that "Septic infection is to be guarded against by covering the parts with soft and absorbent material that will receive and keep aseptic the discharges that drain away from them and that will purify from septic particles the air that passes through them to the wound. For this purpose many substances will be found useful. Among those more commonly employed are cotton-wool (absorbent cotton), loosely woven cotton-cloth, gauze and lint, tow, jute, turf-mould, charcoal,

sand and saw-dust. To the natural absorbent properties of these materials it is necessary only to add the presence, throughout their substance, of a sufficient amount of some antiseptic material to destroy or render inert any septic germs that may be brought in contact with it. Materials thus prepared constitute the antiseptic dressings."

Antiseptic Cottons.—This comparatively new class of products has lately, more especially through the published researches of Sir Joseph Lister, found extensive application in Europe and the United States, as a dressing in the antiseptic treatment of wounds. They have been prepared, only to a limited extent by pharmacists; the manufacturers of cotton and surgical dressings having had under their control almost the entire production. Their preparation involves no especial difficulties in work or appliances used and opens up a new field of labor to the pharmacist who is desirous of extending his work in all profitable directions of his profession. It is more than probable that the cause of this delay may be found in the limited demand upon pharmacists for the articles, many physicians purchasing direct from dealers in surgical dressings; and secondly, through their hesitation, in the lack of practical knowledge, as to the proper methods of procedure. The first cause can be eliminated; the second, the writer will endeavor in a measure to supply by giving the formulas necessary, with results of his personal experience in their preparation for hospital employment.

Borated Cotton.—Since, according to the Pharmacopœia, boric acid is readily soluble in 3 parts of boiling water and 25 parts of cold water, it is evident that hot water will readily dissolve 15 per cent. of boric acid and precipitate a very large proportion on cooling, and, if purified cotton be treated with an equal weight of a hot aqueous solution of the acid of that strength and dried it will, of necessity, contain 15 per cent. of the acid; a very desirable strength to insure its antiseptic properties. But in practice it will be found that cotton readily absorbs from about four to five times its weight of water; the exact proportions varying with the absorbency of the cotton, the quantities of antiseptic cotton made at a time, the manner of impregnating with the medicated solution and the degree of subsequent expression. Hence it is better to make the water four to five times the weight of cotton used, impregnate in thin layers in a flat, open vessel and express moderately or in such a manner that after all the cotton has been treated there will be no medicating liquid left. Borated cot-

ton thus prepared, has the acid intimately incorporated into its fibres and is free from loose particles of crystals among its meshes.

Boric acid	80 gm. (2 oz. av. and 360 grs.)
Boiling water	1814 gm. (4 lb. av.)
Absorbent cotton	453·5 gm. (1 lb. av.)

Dissolve the acid in the boiling water, impregnate the cotton, express and dry by exposure to the air or slight heat. Borated cotton thus made contains exactly, in the finished product, 15 per cent. of its weight of acid. The use of a Trœmner solution balance, will greatly facilitate the weighing of quantities in this, as well as in all other formulas herein given.

Benzoated Cotton.—As benzoic acid is soluble in 15 parts of boiling water, the same general method followed in the case of borated cotton, can here be duplicated; using, in addition, a small percentage of glycerin to prevent separation of crystals in the finished product. The strength is 15 per cent. of acid.

Benzoic acid	90 gm. (3 oz. av. 76 grs.)
Boiling water	1814 gm. (4 lb. av.)
Glycerin	57 gm. (2 oz. av.)
Absorbent cotton	453.5 gm. (1 lb. av.)

Proceed as before.

Salicylated Cotton. This is generally made 10 per cent. in strength, with water, alcohol and a small proportion of glycerin to prevent the shaking out, after drying, of the crystals contained in the interstices of the fibres. The following is the formula used:

Salicylic acid	57 gm. (2 oz. av.)
Alcohol	453·5 gm. (1 lb. av.)
Hot water	2268 gm. (5 lb. av.)
Glycerin	57 gm. (2 oz. av.)
Absorbent cotton	453·5 gm. (1 lb. av.)

Mix the acid, in a porcelain or wedgwood mortar, with the glycerin, dissolve with added alcohol, place the solution in a large, flat, open vessel and lay upon the surface of the liquid the cotton in thin layers. After standing for ten minutes in this liquid and absorption is completed, remove, express and lay aside to dry upon a frame. The method of expression may be with the use of the hands, but a better way is between the open rollers of a clothes-wringer so provided that they are not too tightly screwed together. Pilcher observes, that the antiseptic qualities of this cotton may be still further enhanced if before using, a thin layer of it be dipped in a 10 per cent. solution of the

acid, in glycerin, applying this to the wound, first, and then following on top, with a thick layer of dry salicylated cotton, sufficiently wide to extend beyond the outer limits of the wound, on all sides.

Naphthalinated Cotton is made by soaking absorbent cotton, in thin layers, in a saturated solution of naphthalin in petroleum benzin which dissolves about one part of the former to six parts of the latter, expressing and drying. The following is the formula:

Naphthalin	453·5 gm. (1 lb. av.)
Petroleum benzin	2732 gm. (6 lb. av.)
Absorbent cotton	453·5 gm. (1 lb. av.)

Iodoformized Cotton. Lister accords little value to the antiseptic qualities of iodoform in this shape. It may be made, however, by this formula:

Iodoform	24 gm. (370 gr.)
Ether	250 gm. (8 oz. av., 358 gr.)
Alcohol	750 gm. (26 oz. av., 198 gr.)
Absorbent cotton	453·5 gm. (1 lb. av.)

Dissolve the iodoform in the ether, add the alcohol and proceed in the usual way or, if desired, the cotton may be prepared, extemporaneously, by rubbing the iodoform thoroughly into it and shaking out any excess. As made above, it contains 5 per cent. but can be increased to a much greater strength if wished.

Carbolized Cotton. Cheyne states that this can best be made by soaking sufficient absorbent cotton in a one per cent. solution of carbolic acid in ether, drying at once and using immediately. Any value that it may possess at first, which is questioned, is almost *nil*, after keeping for a time, from the volatility of its active constituent and it is seldom, if ever, employed, especially in view of the great superiority of the carbolized gauze.

Sublimated Cotton. This cotton is readily made by the following modification of Rümmel's formula, and contains one-half of one per cent. of the poisonous mercurial chloride:

Corrossive sublimate	2·5 gm. (39 gr.)
Alcohol	57 gm. (2 oz. av.)
Water	1814 gm. (4 lb. av.)
Glycerin	57 gm. (2 oz. av.)
Absorbent cotton	453·5 gm. (1 lb. av.)

Dissolve the sublimate in the alcohol, add the water and glycerin, impregnate the cotton and proceed in the usual way.

Gauzes. Loosely woven cotton cloth or, as it is commercially known, cheese cloth is much more largely used as an absorbent dressing, impregnated with various antiseptics, than cotton or any other material. It is technically termed "gauze," and its relatively large open mesh-work renders it peculiarly adaptable for the absorption and retention of matter issuing from wounds. It is the basis of the larger number of antiseptic dressings first introduced by Lister,[1] in applying the so-called "Lister Antiseptic Treatment." It is generally cleansed and purified, prior to medication, by first washing with a solution of sodium carbonate and then chlorinated lime, followed by water.

Carbolized Gauze. This is by far the most important and the most in demand of all the gauzes and enters into medical practice whenever the Lister dressings are employed. It is very apt to deteriorate on keeping from the volatilization of its contained carbolic acid, but this can, in a very large measure, be prevented if the finished product be wrapped in paraffin paper. The formula employed is based to a certain extent upon that of Von Brun's (carbolic acid 10 parts, resin 40 parts, castor oil 8 parts and alcohol 200 parts), but it varies in containing glycerin in the place of the oil, and, in addition, petroleum benzin. The following formula contains 10 per cent. in weight of carbolic acid, in the finished product:

Carbolic acid	239 gm. (8 oz. av., 188 gr.)
Alcohol	1200 gm. (42 oz. av., 144 gr.)
Glycerin	150 gm. (5 oz. av., 127 gr.)
Resin	300 gm. (10 oz. av., 255 gr.)
Benzin	1400 gm. (49 oz. av., 168 gr.)
Gauze	1700 gm. (59 oz. av., 423 gr.)

Triturate the resin in a mortar with the benzin, add the alcohol, in which has been dissolved the carbolic acid, and then add the glycerin. Lastly soak the gauze, in 3 or 6-yard pieces, in this mixture, kneading well, to secure uniform diffusion; express and hang the gauze on frames to dry. It dries very quickly, after which, fold in rolls and wrap up in paraffin paper. In order to increase the efficiency of the gauze, it has been recommended that the layers of gauze, prior to application, be dipped in a 1 to 40 aqueous solution of carbolic acid.

In this gauze the acid is, of course, the active ingredient. The resin is used to prevent the washing away of the acid by the discharges from the wound, while the glycerin is employed to make the resin less

[1] *British Medical Journal*, Jan., 1871, p. 187.

brittle, and help, also, the retention of the acid in a more than ordinarily soluble form. Benzin is used to reduce the cost.

Sublimated Gauze.—This dressing is occasionally employed, but not nearly to the same extent as carbolized gauze. It contains 1 part in 2000, or $\frac{1}{20}$ of one per cent. of its active constituent.

Corrosive sublimate	0.85 gm. (13 gr.)
Alcohol	28.5 gm. (1 oz. av.)
Water	2268 gm. (5 lb av.)
Gauze	1700 gm. (59 oz. av., 423 gr.)

Dissolve the sublimate in the alcohol, dilute with water and treat the gauze, in layers, with the liquid. Hang up to dry.

Absorbent Canton Flannel.—Under this term we use, in the Philadelphia Hospital, a canton flannel rendered absorbent by boiling in a 3 per cent. solution of caustic soda for $1\frac{1}{2}$ or 2 hours, until all the fatty matter in the fibres is decomposed, then washing in several portions of cold water, then macerating for 10 or 15 minutes the product in a 1.5 per cent. solution of hydrochloric acid, whereby any traces of free soda are neutralized, and the fibres of the goods are whitened; and, lastly, followed by several washings in water, wringing out with a machine and drying. This product has been found to be peculiarly serviceable in hospital practice as a cheap, efficient and reliable substitute for all the minor cases where at present the so-called patent lint is generally demanded; for example, in local applications of lotion of lead water and laudanum, and as a dressing with various ointments upon chronic sores, ulcers, etc. The proof of its utility may be inferred from the fact that while we used, during 1886, 1500 yards of patent lint, we used, also, 2500 yards of this absorbent canton flannel. In cost it is almost one-half of that of patent lint.

Apropos of the subject of antiseptics, the author was led some months ago to advocate the use of *iodized starch* as an addition to our rapidly growing list of these compounds. Reasoning that the antiseptic activity of iodoform and bismuth subiodide must depend, in part or in whole, upon the iodine freed in their decomposition, in contact with decomposing putrescent organic matter, it was thought that if an iodized compound, readily decomposable, was subjected to the same conditions, that it would induce the same healthful process in the latter case as well as in the first. Full experience has demonstrated the value of the theory in this instance, and iodized starch is now used daily in our hospital practice, and recognized as a valuable adjunct in

certain forms of antiseptic treatment. It is applied in the same manner as other antiseptics, namely: first washing out the wound with pure water, and drying out as far as practicable, then thoroughly dusting in with iodized starch and covering the wound, even beyond its outer edges. The applications are generally made in the morning and evening.

In the removal of the dressings the absorption of the iodine is most strikingly shown. Whereas, in the central parts of the wound, where the exuding pus or matter has come in contact with the bluish-black powder, the same has become wholly decolorized, and shows the white color of the starch, yet, around the outer limits of the dressing, where no excretive matter has exuded, the bluish-black color remains unaffected.

Then comparative trials with iodoform, subiodide of bismuth and iodized starch have demonstrated that it possesses valuable antiseptic qualities as a dressing, and though it may not be superior to the first two named, yet, at the same time, it has occasionally succeeded where they have given unsatisfactory results.

In its preparation the pharmacopœial method, given under "Amylum Iodatum," has been followed, namely, the trituration of 5 parts of iodine with a small quantity of distilled water, and the gradual addition of 95 parts of powdered starch, until the compound has assumed a uniform, bluish-black color. Then dry at a temperature not exceeding 40° C. (104° F.), powder and bottle or box.

ESTIMATION OF ALKALOIDS IN NARCOTIC EXTRACTS.

By Eugen Dieterich.

Translated and abridged from *Pharmac. Centralhalle* 1887, by Geo. H. Ochse, Ph. G.

The examination of all extracts regarding their value is obviously a necessity, and in the case of narcotic extracts is sure to be satisfactory because we are dealing with fixed and known chemical compounds, namely the alkaloids. A narcotic extract to be normal must contain a certain quantity of alkaloid and should it contain a smaller quantity, be it caused by careless preparation or sophistication, it must be rejected.

The requirements which the present German Pharmacopœia exacts (description of the color and formation of limpid or turbid solution) are evidently unsatisfactory and demand a decided correction considering the importance of such medicaments as the narcotic extracts. Re-

cent publications by Kunz and Schweissinger and also Leuken, who merely gave reactions for their identity, have stimulated a desire for further research. With a view of making the examination of narcotic extracts also a subject for study Dieterich makes a critical comparison and gives figures after trying all known methods. He obtained from extracts of belladonna, aconite, digitalis and hyoscyamus all the reactions mentioned by Leuken; but the differences in color between violet and raspberry red and the differences between heavier and lighter precipitation and color (difference between belladonna and hyoscyamus) are not so great as to allow one with limited experience to come to any positive conclusions. Schweissinger's assertion that unsophisticated extract of belladonna does not reduce Fehling's solution has not been confirmed and has since been retracted by him.

Schweissinger's method for determining the alkaloid in aconite, belladonna, hyoscyamus and nux vomica by gravimetric analysis was successful and the author's figures closely correspond with those given by the former so that it may be said a "good beginning" has been made.

Instead of treating the extract with dilute sulphuric acid, adding ammonia and shaking with chloroform, Kunz exhausted with alcohol, evaporated, then made alkaline and treated with ether and lastly with chloroform. By evaporating the ether and chloroform solutions the alkaloid was obtained and subjected to further purification. By this method he undoubtedly obtained a pure alkaloid; but it must be taken into consideration that he operated with 50 grams of extract. Schweissinger found that the chloroform would not emulsionize so readily with the alkaline solution of the extract, and went a step further in not only determining the alkaloid gravimetrically but also volumetrically. Dieterich followed Schweissinger's method and the alkaloid obtained by evaporating the chloroformic solution corresponded in weight with that found by Schweissinger, but did not correspond with the figures obtained by titration as the following table shows:

EXTRACT OF BELLADONNA.

	By Weight	*By Titration.*
1.	1·060 per cent. alkaloid.	0·070 per cent. alkaloid.
2.	1·020 " "	0·116 " "
3.	1·320 " "	0·335 " "
4.	1·480 " "	0·138 " "
5.	1·445 " "	0·046 " "
6.	1·313 " "	0·470 " "

EXTRACT OF HYOSCYAMUS.

7.	0·572 per cent. alkaloid.	0·058 per cent. alkaloid.
8.	0·710 " "	0·116 " "

It is evident that by titration a smaller quantity is obtained than by weighing, but the difference is so great that it cannot be attributed to impurity of the alkaloid. 0·04 gram of pure atropine required 13·6 cc. of 100th normal acid, which is equal to 0·0393 atropine.

A strong penetrating odor and white fumes were noticed coming from the chloroform solution whilst evaporating on a water-bath, and recalling the fact that chloroform vapor at a red heat is decomposed yielding carbon, chlorine and hydrogen chloride, decomposition was supposed to be due to the flame under the water-bath. Part of the chlorine compound was found in the alkaloidal residue by the following experiments: A piece of moistened blue litmus-paper was placed over the flame whilst the chloroform was being evaporated, and reddening of the paper was soon observed. A small quantity of chloroform was placed alongside of some ammonia in a covered flat glass vessel, and immediately on placing a lighted spirit-lamp under the chloroform white fumes of ammonium chloride were noticed, and in a very short time the ammonia solution after acidulating with nitric acid, gave a strong chlorine reaction with silver nitrate. Undoubtedly a portion of the alkaloid combines with the acid thus liberated and is lost for titration. It is unnecessary to remark that the chloroform was examined before trying these experiments and found to be pure.

It being desirable to control the gravimetric analysis by titration, another solvent—ether—was used with satisfactory results. Slight differences were noticed in the yield of alkaloid, but by repeatedly shaking with ether a larger yield was obtained; it is however doubtful if all the alkaloid can thus be extracted, and as a result of his experiments Dieterich comes to the conclusion that it is impossible to completely exhaust such organic substances by shaking or precipitation. Very satisfactory results were obtained by displacement. To accomplish this the extract was treated with an alkali, the mixture made porous and then exhausted with ether. To liberate the alkaloids lime, baryta and ammonia were used, and for porous substances lime and washed powdered pumice stone. After making sure that the lime (in the form of burnt marble) did not decompose atropine, hyoscyamine, strychnine, brucine, etc., the quantity of water most suitable for the

purpose remained to be ascertained. The extract was dissolved in water and mixed with lime and pumice stone and exhausted by continuous displacement (the apparatus used is described in *Phar. Centralhalle*, 1886, p. 273) with ether, a water-bath supplying the requisite warmth. The ethereal solution was evaporated to about 1 cc., several drops of alcohol and 10 cc. of water were added, and the solution was titrated with 100th normal acid, using rosolic acid as an indicator. The results were as follows:

	Extr. Bellad.	*Water.*	*Lime.*	*Pumice.*	*Alkaloid.*
9.	1 gm.	1 gm.	2.5 gm.	10 gm.	.665 per cent.
10.	2 "	2 "	5 "	10 "	.838 "
11.	2 "	1 "	5 "	10 "	.925 "
12.	1 "	2 "	5 "	5 "	.982 "
13.	2 "	2 "	5 "	5 "	1·040 "
14.	2 "	2 "	5 "	10 "	1·040 "
15.	2 "	3 "	10 "	5 "	1·128 "
16.	2 "	2 "	10 "	— "	1·069 "
17.	2 "	3 "	10 "	— "	1·180 "

The largest yield was obtained with a large excess of lime (No. 17). Less favorable were the following experiments:

18.) 2 Ext. Bellad., 2 Ammonia, 15 Pumice; 1·156 per cent. alkaloid
19.) 2 Ext. Bellad., 2 Water, 1 Baryta, 15 Pumice; 1·127 per cent. alkaloid.

Ammonia takes up a great deal of coloring matter and renders titration difficult, and the same, but in a less degree, is the case with baryta. Before giving a definite method, experiments were made to determine whether there is any decomposition of the alkaloid, and secondly whether the alkaloid may be completely removed from the extract treated with lime. Accordingly 10·0 grams of extract of belladonna were dissolved in 15·0 grams of water, 50·0 lime added and treated for half an hour with ether. The 100 cc. of alkaloid solution thus obtained was divided into five portions of 20 cc. each, and a few drops of alcohol and water were added in exper. 21, when reduced to about 1 cc.

	20 cc. evaporated	*Dried at*	*Percentage of Alkaloid.* *Weight.*	*Titration.*
20.	Spontaneously,	40° C.	1·322	1·165
21.	Water-bath,	—	1·315	1·159
22.	"	60° C. for 15 minutes,	1·222	1·045
23.	"	100° C. for 10 "	1·117	0·627
24.	"	100° C. for 15 "	1·110	0·569

Experiments No. 20 and No. 21 can be taken as normal, whilst from No. 22 to No. 24 according to temperature and time used in drying a

considerable discrepancy in the figures attained by titration is noticeable. The question arises if by drying the alkaloid there is a decomposition, or if the dried alkaloid is not so readily affected by the acid. Solutions No. 23 and No. 24 were allowed to stand 1 day and again examined. The solutions were neutral just as on the previous day; if it were due to difficult solubility they should have reacted alkaline and required the addition of more acid. A decomposition, it must be inferred, takes place. Experiments No. 20 and No. 21 show in weighed (crude) and titrated (pure) alkaloid a ratio of 100 : 88.

25) To determine whether ether is quick or slow to dissolve out the alkaloid, 2.0 extr. of belladonna were dissolved in 3·0 water and mixed with 10·0 lime. The powder was displaced with 5 portions of ether. Each portion was collected and examined separately with the following results:

I.	.....0·968 per cent.	Total.....1·169 per cent. of alkaloid.
II.	.....0·072 "	
III.	.....0·072 "	
IV.	..... .0·057 "	
V.	.....traces	

Hence it must be concluded that ether answers for completely extracting the alkaloid.

26) 2 gm. extr. belladonna dissolved in 3·0 water, added 0·040 atropine and 10·0 lime, extracted with ether and carefully evaporated to about 1 cc., added a few drops of alcohol and 10 cc. of water. It required for titration 21·7 cc. 100th normal acid. After deducting 13·6 cc. for the 0·04 atropine added, the remaining 8·1 cc. indicate 1·170 per cent. of alkaloid. The result thus obtained must be considered satisfactory and shows that lime does not decompose the alkaloid.

27) 0·024 grams of atropine dissolved in 3 cc. of water, added 10·0 powdered lime, exhausted with ether, evaporated and dissolved the residue in a few drops of alcohol and 10 cc. of water; required for neutralization 8·1 cc. 100th normal acid corresponding to 0·0234 atropine. The loss sustained is very small and proves beyond doubt that displacement is preferable to shaking.

So far the experiments were made only with extract of belladonna, and although good results were obtained, it was concluded to examine the extracts of aconite, conium and hyoscyamus, and to use—1*stly*, the ordinary method with lime; 2*dly*, with lime and fractional displacement, and 3*dly*, the ammonia process. The following shows the yield in alkaloids:

	Extract.	1*st Method.*	2*d Method.*	3*d Method.*
28—30.	Aconite	1·279 per cent.	1·299 per cent.	1·305 per cent.
31—33.	Conium	0·635 "	0·618 "	0·647 "
34—36.	Hyoscyamus	0·837 "	0·837 "	0·803 "

Whilst the extraction of extract of aconite and extract of hyoscyamus is easily accomplished in half an hour, it required from 1½ to 2 hours to completely exhaust the conium extract. The figures obtained prove the efficacy of the new process. The only doubt was in reference to extract of nux vomica, as some text books give the solubility of strychnine in ether to be 1 : 1250, and brucine as insoluble. To ascertain their solubility in ether, 0·1 strychnine and 0·1 brucine were triturated with 3·0 cc. of water and 10·0 of lime. After extracting the powder with ether for one hour the liquid was evaporated and dissolved in a few drops of alcohol and 10 cc. of distilled water; for titration 7·5 cc. 100th normal acid were required, equivalent to 0·1365 alkaloid. In the meantime the extraction was carried on for another hour. The liquid treated as before required for titration 3·1 cc. 100th normal acid equivalent to 0·0564 alkaloid, making the total 0·1929. This experiment proves conclusively that brucine is not insoluble in ether, and it naturally follows that the amorphous alkaloid, as obtained by the action of the alkalies, must be more soluble than the pure alkaloid.

It was necessary to slightly modify the process for extract of nux vomica owing to the large amount of alkaloid it contains. The same quantity of water and only half the quantity of extract, rosolic acid as indicator and 20th normal acid, in place of 100th normal acid, were used; assuming the presence of equal quantities of brucine and strychnine, 1 cc. of 20th normal sulphuric acid is equivalent to 0·0182 gram of alkaloid.

The experiments were made in a similar manner as with extract of belladonna, with the following results:

(38 and 39) 1.0 extract nux vomica, 3·0 water and 10·0 lime yielded 18·92 per cent. and 18·74 per cent. of alkaloid.

(40) 1·0 extract nux vomica, 3·0 water, 10·0 lime were treated three times with cold ether and then displaced, the four fractions yielded 15·10, 2·36, 0.36 and 0·92, or a total of 18·74 per cent. alkaloid.

(41) 1·0 extract nux vomica, 1·0 water, 2.0 ammonia and 15·0 pumice stone, after one hour's extraction 18·38 per cent., after fifteen minutes more 0·18 per cent., total 18·56 per cent. of alkaloid.

(42) 1·0 extract nux vomica, 0·1 strychnine, 0·1 brucine, 3·0 water, 5 drops diluted sulphuric acid, 10·0 lime yield 18 74 per cent. of alkaloid, after deducting the strychnine and brucine added.

Experiments No. 38 to 42 furnish proof that both lime and ammonia answer for the modified process. Whilst titrating it was noticed that toward the end the reactions were not so distinct as with the other extracts, so that very sensitive test-paper had to be employed; furthermore crystals of alkaloid separated out in the ethereal solution and had to be redissolved in alcohol. As in former experiments lime again proved preferable to ammonia as purer alkaloidal solutions are obtained and more readily titrated.

The above results indicate that the method is well adapted for estimating the amount of alkaloid contained in the extract, but it requires very exact work, and, above all, a complete liberation and solution of the alkaloids.

To determine whether the addition of lime, owing to its great affinity for water would prevent the complete exhaustion of the extract, the extract was dissolved in normal ammonia and mixed with lime, so that the alkaloids were liberated by the ammonia, while the lime merely took up moisture and coloring matter, and by uniform incorporation with the extract rendered it fit for extraction. The following experiments show the results obtained:

(43) 20 extract aconite, 2 cc. normal ammonia, 10 gm. powdered lime, yield 1·279 per cent. alkaloid (compare experiments 28, 29, 30).

(44) 2 gm. extract belladonna, 2 cc. normal ammonia, 10 gm. powdered lime yield 1·156 per cent. alkaloid (compare experiments 17, 18, 20, 21, 25).

(45) 2 gm. extract hyoscyamus, 2 cc. normal ammonia, 10 gm. powd. lime, yield 0·766 per cent. alkaloid (compare experiments 34, 35, 36).

(46) 1 gm. extract nux vomica, 2 cc. normal ammonia, 10 gm. powd. lime, yield 18·74 per cent. alkaloid (compare experiments 38 to 42.)

By comparison it will be observed that the same quantities were obtained as before, proving that either ammonia or lime or both may be used. The slight difference in extract of hyoscyamus is due to the fact that a new extract was used, it having been omitted to reserve a portion of the original extract. The process practically consists in, firstly, liberation of the alkaloid; secondly, extraction with ether; thirdly, evaporation of the ethereal solution, and fourthly, titration. Of these, the third requires a great deal of attention.

a) Examination of extracts of belladonna, aconite, conium and hyoscyamus. Triturate 0·2 grams of powdered lime, prepared from marble, with 3 gm. of water, add 2 gm. of extract, when dissolved carefully add 10 gm. powdered lime. The mixture is then placed in a closed continuous displacement apparatus, the receiving bottle containing about 30 gm. of ether is suspended over a water-bath (not too hot) and the process of extraction is regulated by bringing the ether bottle nearer or further from the water-bath. With extracts of belladonna, aconite and hyoscyamus extraction is carried on for 30 or 45 minutes at the highest. Conium extract requires at least 2 hours. It is advisable to exhaust a second time with ether. The ethereal solution of the alkaloids is transferred to a tared porcelain capsule, and the receiving bottle rinsed 2 or 3 times with small portions of ether; 1 cc. of distilled water is added, and the ether carefully evaporated over a water-bath at a temperature not exceeding 30° C., care being taken not to work near hydrochloric, nitric, acetic or other volatile acid. The residue weighing 1·5 grams, is dissolved in 0·5 cc. of alcohol, spec. grav. 892, the solution diluted with 10 cc. distilled water and after adding 1 or 2 drops of rosolic acid solution (1 : 100 alcohol) titrated with 100th normal sulphuric acid, each cubic centimeter of which neutralizes 0·00289 gm. atropine or hyoscyamine, 0·00523 gm. aconitine, and 0·00127 conine.

The following results were obtained:

Extract of belladonna, (13 experiments) 1·170, 1·184, 1·163, 1·170, 1·156, 1·142, 1·156, 1·142, 1·156, 1·170, 1·184, 1·170, 1·170 per cent.

Extract of aconite root (6 experiments) 1·305, 1·252, 1·279, 1·252, 1·279, 1·279 per cent.

Extract of hyoscyamus (6 experiments) ·780, ·766, ·766, ·751 ·751, ·766 per cent.

Extract of conium (6 experiments) ·609, ·597, ·622, ·622, ·597, ·589 per cent.

β) Examination of extract of nux vomica. 0·2 gm. powdered lime and 1 gm. extract of nux vomica are intimately mixed, 3 cc. of distilled water added and evenly mixed with 10 gm. powdered lime, then exhausted in the same manner as before for 1½ or 1¾ hours. The receiving bottle is rinsed with alcohol twice and then with ether, and after adding 1 cc. of distilled water the percolate is evaporated in a tared porcelain capsule (at the same temperature and with the same

caution as stated above) to 1·5 grams; then add 0·5 cc. alcohol sp. gr. ·892, 10 cc. of distilled water and 2 drops of rosolic acid solution and titrate with 1--20th normal sulphuric acid. Toward the end it is advisable to use delicate blue litmus-paper conveying the solution on the paper by means of platinum wire; 1 cc. of 1--20th normal sulphuric acid corresponds to 0·0182 gram of alkaloid.

The method may be modified by triturating 1 gm. extr. nux vomica with 3 cc. normal ammonia and adding 10 gm. powdered lime. The first process yielded the following results of six experiments: 18·74, 18·92, 18·74, 18·56, 18·65 per cent. alkaloid.

GLEANINGS FROM FOREIGN JOURNALS.

By Geo. H. Ochse, Ph. G.

Test for Thymol.—Thymol dissolved in a pure solution of caustic potassa produces a violet color changing to violet red by agitation on the addition of several drops of chloroform. This reaction takes place only in warm solutions. 0.01 grams thymol shows the coloration quite distinctly.—*Archiv der Pharmacie*, 1887, p. 37.

Salol Mouth wash.—Salol, 1 gm.; alcohol, 100 gm.; tincture of cochineal, 3 to 5 gm.; oil of rose, gtt. 1; oil of peppermint, gtt. 2. Mix. One teaspoonful to a glass of water for mouth-wash.

Liquid Glue.--Sugar 1 part is dissolved in 3 parts of water, to this solution is added one-fourth as much slaked-lime as sugar used and the whole heated to 75°C. The mixture is frequently agitated for several days or until the greater portion of the lime is dissolved. The thick solution is then poured off and is ready for use. If three parts of ground glue are allowed to swell in 13 parts of the sugar solution and then warmed the glue soon liquefies and remains liquid without impairing its adhesiveness. A thicker or thinner consistency is obtained by adding more or less glue to the sugar solution. Concentrated liquid glue remains turbid, thin solutions become clear on standing. The adhesive properties of this liquid glue are excellent.—*Phar. Rundschau* (Prag), Dec. 1886, p. 1021.

Perfumes.—The following formulæ are recommended by Soxhlet:

Eau de Cologne.—Oil of neroli, 5; oil of bergamot, 45; oil of lemon, 20; oil of lavender, 1; oil of rosemary, 1; benzoin, 0.50; deodorized alcohol, 1250.

Court Bouquet.—Oil of bergamot, 10; oil of neroli, 1.50; alcohol

deodorized, 150; orris root, 30; storax, 0.50; musk, 0.20.

Ess. Bouquet.—Ext. jasmin, ext. reseda and ext. violets, of each 50; orris root, 30; liquid storax, 0.50; ambergris, 0.50; oil of Curaçoa, 5. This extract is said to be very nearly the same as Bailey & Co's of London.

Lacmoid obtained by Merck by the action of sodium nitrite on resorcin is more sensitive than litmus and might easily supplant phenolphthaleine. As an indicator the following solution is used: Lacmoid, 0.5 gram; distilled water, 100 cc.; alcohol, (96 per cent.) 100 cc.—*Phar. Zeit. f. Russl.*, xxv., p. 849.

Chloroform contaminated with arsenic is frequently met with, according to Dr. Scholvien. Ten kilograms of chloroform on examination yielded 0.12 gram of arseniate of ammonium and magnesium. To quickly test chloroform for arsenic he recommends shaking with dilute solution of caustic potassa, evaporating and treating with sulphuretted hydrogen in Marsh's apparatus, or more conveniently according to Bettendorf's method.—*Schweizerische Wochenschrift*, xxv., p. 22.

Hayward's hand fire grenades, according to Gawalovski, consist of the mother-liquor obtained in the manufacture of sea-salt. It is an impure solution of chloride of magnesium and chloride of calcium. Gawalovski's analysis showed the presence of 18.329 per cent. calcium chloride, 5.700 per cent. magnesium chloride, 1.316 per cent. sodium chloride, 2.179 per cent. potassium bromide, 0.265 per cent. barium chloride, 72.211 per cent. water, and traces of iron and aluminium chlorides.—*Chemisch-technische Zeitung*, v., p. 22.

THE EVIDENCE FOR THE EXISTENCE OF ACID MORPHINE MECONATE.[1]

By D. B. Dott, F.R.E.S.

At a former meeting of this Society I contributed a paper[2] on the Meconates of Morphine, in which I described the normal meconate, and mentioned that an acid salt also probably existed. At that time there was some doubt as to the basicity of meconic acid. It was generally supposed to be tri-basic; that is, the acid was believed to contain in the molecule three atoms of hydrogen each replaceable by an atom of a univalent radical, each of these hydrogens likewise having

[1] Read before the Pharmaceutical Society of Great Britain at an evening meeting in Edinburgh, Wednesday, Feb. 16.

[2] *Pharm. Journ.*, [3], ix., 883.

the same function. In the case of an organic oxyacid such as meconic this infers the presence of three carboxyl radicals in the molecule. By the researches of Dittmar and Dewar,[3] Mennel,[4] Hilsebein,[5] and others, it is now established that meconic acid is only dibasic though triatomic. In other words, while it contains three hydroxyl radicals it only contains two carboxyls. Whence it appears that the existence of two morphine meconates is theoretically possible. The normal or neutral meconate has been described as above referred to, and it now remains to consider whether there is sufficient evidence to prove the existence of an acid meconate of morphine.

In the identification of a substance, there is no property of so much importance as crystalline form. If a salt having the composition of acid morphine meconate, and possessing a particular crystalline formation, could be prepared, the evidence for the existence of the acid meconate would be complete. No such salt, however, has been prepared, and we have therefore to rely entirely on less satisfactory and perhaps merely negative evidence.

As it is an almost invariable, if not quite invariable, rule, that the neutral and acid salts of a base differ widely in their solubility in a given menstruum; it seemed likely that light would be thrown on the subject under discussion by the following experiments:—A saturated solution in water of neutral morphine meconate was prepared at the ordinary temperature, and then divided into two portions of 50 cc. introduced into separate flasks. To one (*a*) 0·2 gram of morphine meconate was added, which after diligent shaking did not perceptibly diminish in bulk, showing the solution to be saturated. 0·3 gram of meconic acid was then added, and the solution well shaken. The salt did not disappear, and even after the lapse of twelve hours, and with frequent agitation, there was no appreciable diminution in the bulk of the salt. To the other flask (*b*), 0·2 gram of meconic acid was added. On standing several hours with occasional shaking, the acid was slowly dissolved. Now, if acid morphine meconate were more soluble than the normal salt the meconate added to (*a*) ought to have dissolved; while if less soluble than the normal salt the acid added to (*b*) should have caused a precipitation. These experiments, therefore,

---

[3] 'Proc. R. S. E.,' 1869, 129.

[4] *Journ. pr. Chem.*, [2], xxvi., 449.

[5] *Ibid.*, [2], xxxii., 129.

tend decidedly to prove the non-existence of the acid salt. They are not, however, absolutely conclusive, as the acid salt may exist, and yet be decomposable by water. If from a mixture possibly containing acid meconate with excess of meconic acid, a particular solvent should remove morphine and meconic acid in the proportion to form acid meconate, we would have good ground for believing that salt to exist, though it might be in a very feeble state of combination. Unfortunately we know of no solvent which dissolves meconate and which does not at the same time dissolve meconic acid. That test, therefore, cannot be applied. What reasons, then, have we for assuming that acid morphine meconate has ever been formed? Almost the only basis for this belief is the fact referred to in my former paper that a mixture of morphine and meconic acid in molecular proportions under certain circumstances forms an amorphous hygroscopic mass. We have, therefore, to determine whether this mass possesses any properties which cannot be explained on the hypothesis that it is a mixture of the normal meconate with excess of acid. To elucidate that question, the following experiments were tried:—

(1). Morphine and meconic acid in molecular proportions were dissolved in anhydrous alcohol with the aid of heat. On cooling, an amorphous mass was deposited.

(2). Morphine and meconic acid were used in the same proportions, but with 10 per cent. excess of acid, were similarly dissolved, with the same apparent result, no crystals of meconic acid being visible in the amorphous deposit.

(3). Morphine and meconic acid in proportions to form the neutral salt were dissolved in the same manner. An amorphous mass was likewise deposited.

According to the general law in such cases, this amorphous meconate is extremely soluble, but it quickly combines with its water of hydration and then crystallizes out as neutral 5-hydrate until the solution attains its normal condition of saturation. The above results, considered with those stated in former papers, render it extremely doubtful whether the acid morphine meconate really exists. There is certainly no sufficient evidence that it has ever been prepared. All references therefore, in the British Pharmacopœia or elsewhere, to "morphine bimeconate" ($C_{17}H_{19}NO_3C_7H_4O_7$) must be taken as referring to a purely hypothetical compound, which is not surely known to have a being.—*Phar. Jour. and Trans.*, Feb. 26, 1887, p. 690.

SYNTHESIS OF ACTIVE CONINE.

By A. Ladenburg.

Further experiments on a larger scale, and with pure materials, have confirmed the author's previous results (Am. Jour. Pharm. 1886, 344). *a-Allylpyridine* boils at 187·5—192·5°, and is a strongly refracting liquid of sp. gr. 0·9595 at 0°, sparingly soluble in water, and having a distinct conyrine-like odor. The *platinochloride*, $(C_3H_5.C_5H_4N)_2,H_2PtCl_6$, melts at 185—186°, and crystallizes in needles sparingly soluble in water. The *aurochloride* melts at 135—136°; the mercuriochloride and cadmio-iodide are also described. By the action of sodium on an alcoholic solution at the boiling point, *a*-allylpyridine is reduced almost quantitatively to *a-propylpiperidine*. This base has a sp. gr. 0.8626 at 0°, and boils at 166—167°; its hydrochloride crystallizes in white, silky needles, melting at 203—205°. In smell, solubility, specific gravity, and physiological action, *a*-propylpiperidine resembles conine, and not only are the platinochlorides, aurochlorides and cadmio-iodides similar, but when *a*-propylpiperidine is converted into conyrine by Hofmann's method, a blue fluorescence is obtained just as with conine. This fluorescence is due to an accompanying product, for if the fluorescent base after separation from unaltered conine be converted into the platinochloride, the conyrine regenerated from it is no longer fluorescent. Conyrine platinochloride from conine crystallizes in monoclinic forms: $a : b : c = 1·0614 : 1 : 1·5374$; $\beta = 87° 8'$; and the crystals from the synthetical base give practically the values on measurement.

a-Propylpiperidine, however, in addition to the lower melting point of its hydrochloride, is optically inactive, and must be regarded as a physical isomeride of conine. To effect a separation into two optically active bases, a sterilized nutritive solution containing 0·5 per cent. of the tartrate was seeded with *Penicillium glaucum*, but without result. The active base, however, was obtained by introducing a crystal of the salt into a very concentrated solution of *a*-propylpiperidine hydrogen tartrate; a slow separation of crystals took place, which yielded a dextrorotatory base, whose specific rotation was $[a]_D = 13°87'$, compared with $[a]_D = 13°79'$ for conine. The hydrochloride of the synthetical active base melts at 217·5°, that of conine at 217·5—218·5°.

From the mother-liquor, a lævorotatory base was obtained, but it contained a large proportion of the dextrorotatory modification, which could not be further separated by the crystallization method. How-

ever, on converting this lævorotatory mixture into the cadmio-iodide, it was found that after crystallization, the crystallized salt yielded a base which was less lævorotatory than before, whilst from the mother-liquor a base was obtained, which in a 50 per cent. alcoholic solution gave a rotation of —3° 30′ in a decimetre tube, compared with 3° 10′ for conine under the same conditions.—*Jour. Chem. Soc.*, Feb. 1887, 160; *Berichte D. Ch. Ges.*, 1886, 2578.

BITTER ALOES; A CONFESSION OF BEWILDERMENT.*

By J. F. Brown.

Almost the first step in an alphabetical progress through materia medica brings the student face to face with the numerous contradictions which cluster round the subject of this paper, making it appear almost an insoluble conundrum.

You will be relieved to hear that I shall pass by all questions of botanical origin or of chemical formulæ, and consider only those others which have been suggested by a collation of the statements *ad rem* published in the *Pharmaceutical Journal* at different times, and contained in a few standard authorities. All these agree that the drug is the inspissated juice which has exuded or been pressed from superficial vessels in the leaf, and that the different varieties fall naturally into two classes, of which Socotrine and Barbadoes are convenient types.

With the single but weighty exception of the late Peter Squire, all represent the first class as usually prepared by solar heat, the second by artificial evaporation. There is a consensus of opinion on the solitary point that the latter process is injurious to the quality of the drug, which is, however, unsupported by facts. On almost every other point there is an amusing see-saw of learned evidence, worthy of the famous trial at law of the simple question—what is coal?

Thompson ascribes the superiority of Socotrine aloes to the greater proportion of extractive contained therein. Squire gives the proportions of extract as 75 per cent. and 50 per cent. for Barbadoes and Socotrine respectively.

Squibb ascribes the more drastic nature of Barbadoes to its having

*Read before the Dover Chemists' Association. Reprinted from *Phar. Jour. and Trans.*, Feb. 19, 1887, p. 678.

been prepared by boiling; but it is questionable whether the two classes differ essentially in their operation, or merely in degree, needing only readjustment of doses to overcome it. A more important question, indeed the cardinal point in discussing the thereapeutics of aloes, is, whether aloin is the true active principle or measure of value of the drug. In spite of the boiling, it is the Barbadoes variety which has generally been used as the source of this principle. Tilden, however, regards Barbaloin, Socaloin and Nataloin as unmistakably different substances. In the hands of Plenge, Tilden's process gave yields of 3 per cent. from Socotrine and 9 per cent. from Barbadoes respectively. An alternative process, in which Socotrine was treated by boiling in alcohol for two hours, gave 10 per cent. of aloin; but it is difficult to reconcile this method of separation with Squibb's statement that, with the exception of about 6 or 7 per cent. of impurities, the whole of the drug is soluble in alcohol.

Tilden considers that all varieties owe their bitterness to the aloin they contain, and he obtained 20 per cent. from Barbadoes by treating it as for extract, evaporating the liquid resulting from 1 lb. of aloes to 32 fluidounces, which must consequently have been a 10 per cent. solution of aloin.

Craig states that aloin constitutes 25 per cent. of aloes, yet Mitchell obtained only between 8 and 9 per cent. from Barbadoes, and oddly enough, states that the residual liquid from 1 lb. yielded 10 oz. of "very good" extract.

It appears then that the boiling, which is so strongly deprecated both in obtaining the crude drug and in making its galenical preparations, is consistent with a larger yield of aloin and greater purgative power in the aloes so prepared.

Most curious is it also to note that while the sun-dried Socotrine is generally regarded as the standard quality and described by Tilden and Rammell as consisting mainly of crystallized aloin with some resinoid, the authentic specimen procured by Professor Balfour, when examined by Dott, yielded only 2 per cent. of the former to 55 per cent. of the latter, and was regarded as more historically interesting than medicinally valuable.

If the reason for this be sought for in the fact that it had been kept for three years, we are confronted by the statement of Tilden that aloin is not easily decomposed by heat in neutral or slightly acid solution, which latter condition is stated by Branson to

be natural both to the juice of the leaf, and an aqueous solution of the drug; also by the well-known practice of storing a certain variety of aloes, whereby it is believed greatly to improve. Prolonged exposure to moist heat is said by Tilden to convert aloin into a brown substance, called by Craig "changed" aloin, and stated by him to retain its therapeutic activity, since numerous experiments on human beings and rabbits showed that 1 or 2 grains acted as a mild aperient. So that Aitken's complaint of the injury done to the extract by the employment of steam heat in its preparation seems hardly well founded.

Royle and Headland state that aloin heated to 212° F. is rapidly oxidized and decomposed, but Tilden considers the presence of alkali essential to rapid oxidation, and notes that potassium carbonate is specially conducive to this change.

In Paris's "Pharmacologia" it is held that the purgative property of an alkaline solution diminishes, *pari passu*, with the bitterness; Branson remarks that the decoction becomes less purgative by keeping, and Tilden states that the oxidized and tasteless alkaline solution has no effect, but W. Young found that the varying degrees of bitterness did not affect its aperient activity. My own very limited experience leads to a doubt whether a sample of concentrated decoction, which from keeping has ceased to be unbearably nasty, is therefore necessarily inefficient.

Cathartic remedies excel most others in the completeness with which their action is demonstrated; that such clouds of doubt, therefore, obscure the truth with regard to one of the best known of this class lessens our wonder at the virtues alternately affirmed and denied to belong to those whose working is less palpable.

The uncertainty as to the dose of aloin will illustrate my meaning. T. and H. Smith state the relative proportion as 1 to 5 of aloes; but Tilden took ½ to 1 grain without effect, although it does not appear that he controlled the test by taking 5 grains of aloes. Dr. Craig gives the dose as ½ to 1 grain, the B.P. ½ to 2 grains, Squire 1 to 2 grains, Mitchell 1 to 3 grains, and Martindale 1 to 4 grains. Stillé and Maisch regard aloin as probably two or three times as active as good aloes, and quote Dr. Harley to the effect that 1½ grains will produce two or three copious evacuations in a strong adult, and that 2½ grains are a powerfully cathartic dose.

This is rebutted by Dobson and Tilden's published record of fifty cases, principally adult males, in which all three kinds were given in doses not exceeding 2 grains, with effect described as "slight and very uncertain."

Barbaloin, especially with soap, appeared slightly the strongest of the three, but nataloin in 6-grain doses failed to act in some, in other cases acted freely in smaller dose. The authors conclude that aloin acts as well as an equal dose of aloes and gripes less. By A. P. Brown aloin is considered not more active than an equal dose of aloes, and the resin inert, while Proctor's personal experience is that aloes, aloin, uncrystallizable extract and insoluble portion all acted equally well.

That the solubility of aloin in water should be variously stated as 1 in 60, 1 in 90, and 1 in 500, and as insoluble—freely soluble—soluble 1 in 30 of alcohol—is only part of the puzzle.

It is agreed that the resin is very uncertain when used hypodermically, but Tilden and Craig take diametrically opposite views as to whether it is "changed" (possibly dehydrated) aloin, or something essentially different. The latter gave 8 grains with good effect, but 12 grains of a sample specially prepared free from aloin by Messrs. Smith failed to operate. Craig's own process consisted in dissolving well-washed resin in spirit, and precipitating by the addition of boiling water. Fifteen per cent. of the product was insoluble in spirit, and gave 23 per cent. of ash. It is known that the insoluble part of aloes is to some extent rendered soluble by prolonged contact with hot water, but this experiment points to such treatment rendering that insoluble in alcohol which had previously dissolved.

The successful hypodermic administration of aloin seems to render needless the elaborate building up of those composite pill structures, with casings of various degrees of solubility, which were recently recommended.

Would it be too much to ask some competent student of therapeutics, if the ever-rising flood of novelties will permit, to try and throw some light upon the action of this old and familiar drug. My own diffident guess is that when submitted to the process of digestion, and especially to the eminently solvent properties of the bile, the whole of the drug, save only the desert sand and comminuted monkey skin casually and occasionally accompanying it, is capable of producing its well-known benign effect.

NON-ACID CONSTITUENTS OF BEESWAX.

By F. Schwalb.

Repeated boiling with alcohol extracts about 5 per cent. of cerotic acid from beeswax. The residue is saponified with alcoholic soda, and after the alcohol has been removed by distillation and by boiling with water, the soap is separated by the addition of common salt. To remove any free alkali, the soap is pressed in a cloth, redissolved in hot water, and again salted out. This operation is repeated several times. The soap is thoroughly dried at 110—120°, and the non-acid constituents are separated by fractional solution in, and recrystallization from, light petroleum. The most soluble portion of the extract, melting between 55° and 65°, contains two hydrocarbons; one melting at 60·5° appears to be identical with Krafft's normal heptacosane, $C_{27}H_{56}$ (1882), and the other which melts at 67°, is probably identical with normal hentriacontane, $C_{31}H_{64}$. It is probable that other hydrocarbons are also contained in the wax.

The myricyl alcohol is less soluble in light petroleum than the hydrocarbons. It appears to have the formula $C_{31}H_{64}O$, and is not identical with the alcohol $C_{30}H_{62}O$, contained in carnauba wax. It melts at 85—85·5°, and resolidifies at 84°. When heated with soda lime, it is converted into the salt of an acid, $C_{31}H_{62}O_2$. This acid is sparingly soluble in the usual solvents at the ordinary temperature, but it dissolves in hot light petroleum, and is deposited from the solution in white needle-shaped crystals, which melt at 88·5—89°. The lead salt melts at 115—116°, and dissolves freely in acetic acid and in boiling toluene. The silver salt is amorphous. It melts at 180°, with decomposition. The copper and magnesium salts are also amorphous. They dissolve in boiling benzene. The methyl and ethyl salts crystallize in needles. They dissolve freely in warm ether and warm alcohol. The methyl salt melts at 71—71·5°, and the ethyl salt at 69·5—70°. Heated under the ordinary atmospheric pressure, the ethyl salt decomposes before boiling into ethylene and the free acid.

Beeswax also contains two lower alcohols, namely, ceryl alcohol, $C_{26}H_{54}O$ or $C_{27}H_{56}O$, and an alcohol of the formula, $C_{24}H_{50}O$ or $C_{25}H_{52}O$.—*Jour. Chem. Soc.*, Feb., 1887, 124; *Annalen*, vol. 235, p. 106.

ABSORPTION THROUGH THE SKIN.

Ritter and Pfeiffer have repeated the experiments which have been made on this much-disputed topic, and their results serve to strengthen the doubts which others have before expressed as to the capability of the skin to absorb the substances which have been long used, probably following up a false analogy with the effects of mercurial inunctions, with the intention of producing their constitutional effects by their transmission through the skin into the general blood-current. The method which they employed consisted in rubbing well into the extensor surface of a perfectly healthy arm or leg about half an ounce of a salve containing the substance under investigation, and then keeping the skin firmly covered for 24 hours with a protective bandage, so as to prevent any possible absorption by the lungs. The urine was collected for 24 hours and examined, both with and without previous concentration, for the presence of the drug. By these means it was found that a 10 per cent. iodide of potassium salve transmitted the salt through the skin only once in five different cases, and then only after being used for four days; that is, in other words, only after the skin had been irritated and its continuity destroyed by the prolonged action of the fatty acids derived from the decomposition of the lard.

Salicylate of soda applied in the same way never showed the slightest trace of its presence in the urine.

Salicylic acid, on the contrary, invariably gave its characteristic color test with ferric chloride within a few hours after its application. This is easily explained by its well-known action in softening the epidermis and rendering it permeable. If iodide of potassium be applied to a spot which has been previously treated with salicylic acid, it quickly passes into the organism and becomes detectable in the urine.

In a series of parallel experiments made with the view of testing the reputed power of Liebreich's lanolin in assisting bodies incorporated with it to penetrate the skin, the authors were unable (in common with the majority of other experimenters) to perceive that it possessed such power in the slightest degree. [Its physical properties are, however, undoubtedly useful as a salve base.]

Ritter repeated also the experiments which he had previously carried out in order to test the capability of the skin to absorb substances which were sprayed on to it in watery solution. Röhrig, and later Juhl, had asserted this apparently paradoxical action really occurred.

Ritter, however, after carefully excluding all possibility of any entrance of the fluids into the system through the mouth or respiratory passages, was utterly unable to find in the urine the slightest trace of the salicylate of soda or iodide of potassium with which he experimented, and therefore confirms the result of former experiments of his, that the normal skin is not permeable to substances in spray-solutions.—*Med. Chronicle*, Febr., 1887; *Berlin. Klin. Wochenschrift.*

METHYLAL.*

By B. W. Richardson, M. D., F. R. S.

At a meeting of the British Association for the Advancement of Science, held at Norwich, in 1868, I brought out for the first time the chemical fluid called *Methylal* as an anæsthetic and hypnotic, and at a meeting of the same Association at Exeter, in 1869, I again drew attention to it in order to make it useful in practice.†

Methylal is a colorless fluid of specific gravity 0·855; its vapor density is 38°, taking hydrogen as unity; and boiling-point of 42° Cent., 107·6° Fahr. Its solubility in blood is one part in three; its composition is $C_3H_8O_2$. It is made by distilling methylic alcohol with sulphuric acid in the presence of peroxide of manganese, but it requires several re-distillations before it can be obtained in the pure state, for which reason it is at present a very expensive compound. The first specimens with which I experimented were made in my own laboratory; later specimens have been made for me, with much care, by my friend Mr. Williams, the well-known operative chemist.

When methylal is quite pure it is almost tasteless, but bites the tongue, and owing to its low boiling-point quickly evaporates. The odor of it is fragrant, and not very powerful. The pure vapor creates no irritation on being breathed.

After long exposure to the vapor of methylal, in an atmosphere containing not less than 35 per cent. of the vapor, warm-blooded animals may be made to pass into a sleep which, once established, is deep and prolonged. In my first researches the sleep so induced lasted for intervals of two and even three hours, but I believe now that this long narcotism was due to the presence of acetone, from the methylal not

*From the *Asclepiad* No. 13. Reprinted from *Phar. Jour. and Trans.*, Feb. 13, 1887.

† 'Reports of the British Association for the Advancement of Science.' vol xxviii., pp. 183–4, Norwich meeting; and vol. xxix. p. 406, Exeter meeting.

having been sufficiently purified. Last year with a perfectly pure specimen, made by Mr. Williams especially for my work, I endeavored to anæsthetize two dogs with methylal in order to enable Mr. Mavor, the veterinary surgeon, to operate upon them painlessly. After half an hour's inhalation of the vapor narcotism was not produced. The fluid was then injected hypodermically in one animal to the extent of an ounce dose, upon which a gentle sleep, or rather intoxication, followed, but with no sufficient anæsthesia to allow of painless operating.

In my report of 1869 I showed that methylal, which is very soluble in water, could be administered by the mouth when diluted with water, or by hypodermic injection, and I have prescribed it occasionally, as a mixture several times. I usually begin with a fluid drachm dose, mixed either with glycerin or syrup of orange flowers and distilled water. Example :—

Methylal, pure	℥ vj.
Syrup of orange flowers	℥ iv.
Distilled water	℥ vj.

Mix. To make a solution of 6 ounces; of which let 1 to 2 fluid ounces be taken in a wine-glassful of water as directed. The dose may gradually be increased to twice the above quantity or more.

In action, as a medicine, methylal lies between alcohol and anhydrous ether. It quickens the action of the heart with reduction of arterial pressure; it makes the respiration slow and deep; it induces a tendency to sleep; and, it is a sedative to pain, but not to a very deep degree. On the whole it would be best to keep it in the group of anodyne antispasmodics, in which I originally put it. It causes very little muscular excitement and no vomiting, but after long inhalation of its vapor it produces a free flow of saliva. As it mixes well with alcohol and with ether it might be administered with either of these agents; and it might also be given with amyl nitrite for the relief of colic, asthma, angina pectoris or tetanus; but before it can come into general use it must be reduced in price.

Signor Personali, who has recently been experimenting with methylal, (see Am. Jour. Phar., January, 1887, p. 19) seems to have arrived at results similar to my own; but he adds that it may be used as an ointment or liniment for external application. It is true that it mixes fairly with oil and with lard; but as it boils at 107° Fahr. I cannot see how it can be of any service for external use, except in causing a slight local anæsthesia by cold, from evaporation.

DETECTION OF ARTIFICIALLY COLORED RED WINE (CLARET).

By J. Herz.

To 30—50 cc. of the wine, or if the quantity of coloring matter in the wine is small, 100 cc. concentrated to 30 cc., 20—30 cc. of a saturated solution of magnesium sulphate, and 10—20 cc. of soda solution are added, stirring well; if necessary the treatment is repeated until the liquid is colorless, or nearly so. The filtrate is made acid with dilute sulphuric acid (1 : 3), and if sulphonic acid colors are present the red color reappears. The most commonly used member of this group, *acid-magenta* (rosanilinesulphonic acid), yields a violet-red solution, and can be estimated by comparing the tint with magenta solutions of known strength. One mgram. of magenta per litre can be distinctly detected in 30 cc. of wine without previous concentration. When *archil* (*orseille*) colors are present, the filtrate is bluish, and when made acid turns a litmus-red color. To test for magenta under such circumstances, Blarez' method of shaking with lead dioxide is used; this destroys the orseille and natural color. Cazeneuve's method is not recommended. To test for other colors in the magnesium hydroxide precipitate, the gelatinous mass is stirred up with hot water, allowed to settle, and the liquid decanted off. If only the natural color of the wine is present, or *bilberry* has been used, this liquid is yellow-brown; if *archil* has been used, dark-violet; if *ponceau*, onion or ponceau red; if *cassissine*, pale-red or dark-yellow; if *vinicoline bordelaise*, a yellow-red to yellow-brown liquid, which when poured on sulphuric acid gives a violet ring. By shaking the colored liquid with amyl alcohol, *ponceau* yields an onion-red residue; *vinicoline*, a dark-brown one; *cassissine*, a dirty-green, violet at the edge, turned yellow by strong hydrochloric acid. The precipitate is a dark-grey or brownish-grey color when the natural or vegetable colors only are present; with *archil*, it is violet; with *magenta* (acid or ordinary), dirty white; with *cassissine*, dirty yellow-brown; with *vinicoline*, crimson-red. The precipitate is mixed with sand, dried, and extracted with ether; the extract contains any ordinary magenta which can be identified in the usual manner by dyeing wool, or *cassissine* which dyes wool red-brown and leaves a yellow-brown residue in the dish. The dyed wool becomes yellow when treated with strong hydrochloric acid and colorless with ammonia. When wine is shaken with amyl alcohol, and the colored extract evaporated, the

residue, if it contains the substances named, behaves in the manner described below :—

		With concentrated		
		H_2SO_4.	HCl.	NaHO.
Archil	violet-red	blue	red	blue
Bordeaux, B.....	carmine	carmine	carmine	carmine
Ponceau, RRR....	dark-red	crimson	crimson	brown
Cassissine.....	violet-purple	yellow	yellow-brown	red
Vinicoline Bordelaise.....	cherry-red	brown	red	brown

whilst the wine after extraction is cherry-red with ordinary *magenta*, violet-red with *acid-magenta*, dark-cherry with *Bordeaux*, yellow-red with *ponceau*. Wine colored with *magenta* produces a violet froth. The detection of vegetable coloring matters in presence of the natural color of wine or otherwise is a matter of great difficulty, and most of the known methods are ineffectual; it is, however, effected by the author with comparative facility in the following manner:—10 to 15 cc. of wine is shaken with 5 cc. of a saturated solution of tartar emetic, and then examined by reflected and transmitted light either at once or, if no immediate change has taken place, after some time. This treatment produces with genuine red wine always a cherry-red color, and with other substances as follows:—*Red-poppy* (*Papaver Rhœas*), dark cherry-red; *cherry*, violet; commercial *elder* coloring matter, red-violet; *bilberry* (*Vaccinium Myrtillus*), blue-violet; *privet-berry*, pure violet. White wines artificially colored, and red wines mixed with artificial colors have been successfully examined in this manner; in the latter case the wine some time after treatment is compared with a genuine red wine to distinguish more readily the change of color. Old solutions of privet do not give the color change. Sodium hydrogen carbonate produces with pure *elderberry*, grey-violet; and with *bilberry*, brown-green. Tartar emetic appears to form an antimony lake with the coloring matters. With practice, all the above-mentioned colors can be detected in 30—50 cc. of wine. In the subsequent communication the author acknowledges the priority of Ambühl and Elsner's recommendation of the use of tartar emetic for the purpose in question. They, however, recommend hot solutions; the author finds cold better. Fermented bilberries give the violet color even better than unfermented berries, especially when fresh, inasmuch as oxidation interferes with the delicacy after a time. The distinctness of this color is increased by diluting the wine.—*Jour. Chem. Soc.*, Jan., 1887, p. 91; *Chem. Ztg.* x. 968, 998.

MINUTE OF THE COLLEGE MEETING.

The annual meeting of the Philadelphia College of Pharmacy was held March 28, 1887. The President in the chair. Twenty-two members present. The minute of the last stated meeting was read and adopted. The minutes of the Board of Trustees for the meetings of January, February and March were presented, and on motion approved. At this meeting of the College the usual reports of standing committees, and of other business matters are presented. The editor's annual statement is condensed as follows: "During the year just closed, fifteen papers were read at the various meetings fourteen of these were published in the Journal—this is an increase in such original contributions over the corresponding previous period. In addition to the editor's personal labors, only six members of the College contributed papers, but acknowledgement is due to many writers who contribute though not members. The total number of authors is seventy-four, included in which computation are abstracts from forty theses of the graduating class of 1886. The gleanings from foreign periodicals have mostly been compiled by Mr. Geo. H. Ochse, Ph G., to whom readers have been indebted in former years. These compilations have been amplified by practical notes collected from various sources.

The Committee on Publication offered the following report: "The Publication Committee have the honor to report that the Journal of the College has been issued with its usual regularity and promptness during the year just closed. As an exponent and record of the progress of pharmacy, we think it well attains the object for which it was established and deserves the patronage of every pharmacist who desires to keep abreast with the progress of pharmacy and allied sciences.

The editor's report accompanying this will give in detail the literary work, and the treasurer's report, the financial."

Very respectfully,

HENRY N. RITTENHOUSE,

Chairman Public. Committee.

The Treasurer of the Publication Committee presented the statistical, and also the financial statement of the Business Editor, as well as a report of the Treasurer of the Committee which latter was on motion, directed to be entered upon the minutes. This report gives as is usual the business condition of this department of the College. The account of the Treasurer of the Committee had been vouched and audited. In order to adjust the account, and furnish the committee with the necessary working capital, orders for requisite amounts were on motion ordered to be drawn on the Treasurer of the College, and on the Treasurer of the Publication Committee respectively.

The Librarian presented his annual statement which is condensed as follows: After enumerating the additions to the library, and giving the character of the various works received during the year, he gives also a financial account of his current expenses which being balanced leaves a small amount in his hands.

The Curator also presented his report, which may be summarized as follows: Allusion is made to the good order and condition of the museum and contents, the receipt of numbers of rare and new drugs is acknowledged, reference is made to the importance of this adjunct of the college as a material aid to the educational system, and it is urged that the collection should contain well-made specimens of galenical preparations. Attention is called to a new method of indexing being perfected which when completed will facilitate accessibility to the objects.

The resignation of William Weber from membership in the college was read, and on motion accepted.

The following gentlemen were elected by *viva voce* vote delegates to represent this College at the coming sessions of the Pennsylvania Pharmaceutical Association: Chas. A. Heinitsh, Alonzo Robbins and Robert England.

On motion the President appointed Messrs. Jenks, Maisch, Trimble, Remington and Wiegand as a committee to receive and welcome the members of the Pennsylvania Pharmaceutical Association, on the occasion of the annual meeting in June next.

This being the recurrence of the annual election the President ordered a ballot with the following result:

For President, Chas. Bullock; 1st Vice President, Robert Shoemaker; 2nd Vice President, W. J. Jenks; Treasurer, S. S. Bunting; Corresponding Secretary, Dr. A. W. Miller; Recording Secretary, W. B. Thompson; Editor, J. M. Maisch; Librarian, Thos. S. Wiegand; Curator, Jos. W. England; Publication Committee, Chas. Bullock, H. N. Rittenhouse, T. S. Wiegand, James T. Shinn, John M. Maisch, Editor; Trustees for 3 years, T. Morris Perot, J. T. Shinn, J. P. Remington.

WILLIAM B. THOMPSON,
Secretary.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, March 22d, 1887.

The sixth pharmaceutical meeting of the present series was held this day, Wm. J. Jenks being asked to preside.

The minutes of the last meeting were read, and as no corrections were required they were approved.

Professor Maisch presented a petrifaction, Dictyophyton tuberosum, sent by Mr. Luin B. Switzer of the last junior class, and obtained in the neighborhood of Bath, N. Y. It was directed to be placed in the cabinet of the museum.

Mr. Joseph W. England read a paper upon *antiseptic cottons and gauzes*, giving a concise history of their origin and use, which was referred to the Publication Committee; numerous specimens of the products obtained by the described processes were exhibited. In reply to a question, Mr. England stated that at the Philadelphia Hospital the unmedicated absorbent cotton was purchased from manufacturers. Prof. Maisch stated that some 7 or 8

years ago there was nothing published in relation to the preparation of absorbent cotton, and that having tried several simple solvents for removing the oil from the cotton without success, he induced Mr. F. L. Slocum to experiment in this direction, who fully succeeded by repeatedly boiling with a weak solution of caustic alkali, and whose results were then published in the AMERICAN JOURNAL OF PHARMACY (1881, page 53). The commercial absorbent cotton, and also the medicated cotton, was stated to be always of handsome appearance, and its unentangled condition was probably due to carding.

Mr. Hance said that the preparation of absorbent cotton was not at all difficult if caustic soda solution, not too strong, was used; this was afterward washed away and the cotton treated with chlorinated lime to bleach it, after which it was dried and carded; but medicated cottons containing remedial agents either in pulverulent or finely crystallized form, particularly if these were present in considerable amount, would be rendered almost valueless by carding as the remedy would be dusted out. In such cases the addition of glycerin is deemed advisable, or even necessary, to keep the cotton moist.

Mr. Procter called attention to a plan which he had put in use for facilitating the correct recording of necessary data upon prescriptions which are left to be sent, or are to be called for after a lapse of some time; it consists in stamping with a rubber stamp upon the prescription, name, address, price, receiver, dispenser, and such other particulars as may be deemed necessary, the blanks being properly filled out in writing. Similar memoranda are stamped and written upon the wrapper. This plan had been found very convenient and saving in time in the asking and answering of questions, and in the proper attention to the requests of customers. The same stamp may likewise be used for articles other than prescribed medicines, if not delivered immediately.

Mr. Walling spoke of *chrysophanic acid* as having been prescribed with the express statement that *chrysarobin* was not intended; he wished to know if there was any chrysophanic acid to be obtained in a commercial way that differed from chrysarobin. To this query Professor Maisch replied that the name of chrysophanic acid was introduced in medical practice through the investigations of Goa powder by Prof. Attfield, who regarded the crystalline principle obtained with hot benzol as being mainly chrysophanic acid, but proposed to name it chrysarobin. Two German chemists, Liebermann and Seidler, had subsequently examined it, and found it to be a new compound for which the very appropriate name chysarobin was retained, and which was readily converted into chrysophanic acid, identical with that obtainable from rhubarb as a decomposition product of the glucoside chrysophan. He thought that what was commonly sold as chrysophanic acid was merely chrysarobin. In answer to a question, Mr. J. W. England stated that at the Philadelphia Hospital chrysophanic acid was often prescribed in skin diseases, and it was suggested that he examine the article in use and report on it at the next meeting.

Mr. Jenks said that his experience was that chrysophanic acid was the commercial term always used, and that he had no doubt that the product was chrysarobin.

Professor Maisch said such uncertainty came from the difficulty of inducing men who had become accustomed to a term, to change it to a more appropriate one and thus to correct their habit; this he said was illustrated by the confusion which for a long time existed in the chemical literature of the alkaloids of cinchona bark. Forty years ago Winckler, a German chemist, had isolated an alkaloid which he named *quinidine*, but which was shown by Pasteur to have the same ultimate composition as cinchonine and was named *cinchonidine* which nomenclature was generally adopted by French, English and American chemists, but not by many other chemists until about ten years ago, since which time the literature on cinchonidine and quinidine was not as confusing as during the preceding thirty years.

Mr. England gave an account of the treatment of consumptive patients at the Philadelphia Hospital by enemata of *carbonic acid gas*, which is prepared by decomposing either calcic or sodic carbonate with sulphuric acid, washing it through a solution of 5 grains each of calcium sulphide and sodic chloride in a pint and a-half of water, and collecting the gas in flat rubber bags; the injection is directed twice daily. The results are so striking as to demand notice. The most emaciated patients have been greatly improved, appetite and strength seems to return and the patients have steadily improved. Mr. Robt. England stated that large doses of *tannin* had been given in the same disease and with good results.

The *pharmacy law*, which is now before the Legislature of Pennsylvania was discussed in some of its features. While prescribing in diseases was considered to be out of the province of the pharmacist, it was stated by several of those present, that the pharmacist would always be obliged to furnish simple remedies upon the application of customers.

There being no further business on motion adjourned.

THOS. S. WIEGAND,
Registrar.

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS

Philadelphia College of Pharmacy.—The preliminary examinations of the Junior Class were held in November and December last, and passed off satisfactorily. The following questions embrace those of the two preliminary and of the final junior examination, which latter took place on February 19th.

BOTANY AND MATERIA MEDICA.

1.—Explain the nature of a *living cell*, and of its *contents*. Name some of the *cell markings*, and state how they are produced.

2.—Explain the nature of *closed* and of *open fibrovascular bundles*. In what plants or class of plants is each kind found, and in what manner is each kind arranged in the stems of these plants?

3.—Explain *a*) the *growth of leaves*, *b*) their *anatomical structure*, and *c*) the different forms of *venation*.

4.—Give a brief history of the *development* of *stamens*, define their *position* in the flower, and name for each variety of position some officinal flowers or herbs.

5.—Give the botanical name, the habitat, the shape of the leaves, the color of the flowers, and the medical properties of each of the following officinal herbs: *Thoroughwort, Grindelia, Tansy* and *Wormwood.*

6.—Give the botanical characters of the natural order of Rosaceæ. In what respects do its three principal *Suborders* differ? Mention some drugs or useful plants from each of these Suborders.

THEORY AND PRACTICE OF PHARMACY.

1.—Define *syecific gravity* and *specific volume,* and give the specific gravity and specific volume of the *officinal liquid* which weighs 647 grains to the fluidounce, water weighing 455.7 grains at the same temperature. Show all of the figures used in making the calculation.

2.—Define *evaporation, distillation* and *sublimation.*

3.—Describe a *method of filtering* through paper substances which are solid or semi-solid at ordinary temperatures and which require the constant application of heat to retain them in a liquid condition; illustrate the subject with a drawing.

4.—Describe the *process of decantation* and illustrate its effectiveness by an example showing the production of an insoluble salt by the mixture of two simple solutions.

5.—Give the process for making Acidum Nitrohydrochloricum, U.S.P. What are its properties and uses? What compound is produced during the process, and what precautions are necessary in dispensing the Acid?

6.—How would you prepare by an officinal process, an antidote to poisoning with Arsenic? Describe its mode of action upon this poison.

CHEMISTRY.

1.—What is the use of the *Barometer*? Explain the principle upon which it is based. Why is *mercury* used rather than water in the ordinary barometer?

2.—What is the action of a *glass prism* upon a ray of *white light* passing through it? Enumerate the simple *colors* of the *Spectrum.* What is the *Spectroscope,* and what is it used for?

3.—How are *binary molecules* named? Give an example. Define an *acid,* a *base,* and a *salt.* Are *haloid salts* binary or ternary molecules?

4.—Write out the reactions for making *chlorine* by the two methods generally used. For *what element* has chlorine an especial affinity? Give illustrations. What are the *pharmaceutical* and *practical uses* of chlorine?

5.—What is the difference between an Acid Sulphite and a Neutral Sulphite? Illustrate by giving the formula of an officinal Salt of each class. How do Thio-Sulphates differ in formula from Sulphates and Sulphites? Illustrate by example, using officinal Salts.

6.—Name the officinal varieties of Carbon. State the source of each and mention the points in which they differ. State the pharmaceutical and technical uses for each of these varieties.

QUESTIONS BY THE COMMITTEE.

1.—Name and describe five implements or appliances in common use at the prescription counter. Give a short description, and an explanation of the use of each.

2.—Describe the occurrence of Sulphur in nature. In what forms is Sulphur found in the shops? Give the officinal names of these several varieties. To what impurities are these liable?

3.—Give a typical formula for an officinal fluid extract. State why the process of evaporating the weak percolate to a soft extract is preferred to the former method of adding the evaporated liquid to the reserved portion.

4.—How does the descending axis of Monocotyledonous and Dicotyledonous plants usually differ in structure and development? Briefly describe the chief distinctive characteristics of the ascending axis, and leaves of the Monocotyledons and Dicotyledons.

SPECIMENS.

Santonica.	Aqua Anisi.	Acidum Sulphurosum.
Lobelia.	Liquor Ferri chloridi.	Potassii chloras.
Lavandula.	Spirit. Æther. nitrosi.	Magnesii sulphas.
	Syrupus Zingiberis.	

In *Operative Pharmacy* the students were required to prepare Syrupus Ferri iodidi and Unguentum Hydrargyri nitratis.

The re examination of those junior students who failed in the February examination in one or more branches will be held on Friday afternoon, September 30th, at 3 o'clock.

The examination of the senior students took place from Saturday afternoon, February 26th, until Thursday, March 3, operative pharmacy and chemical analysis being the subjec s reserved for the last day.

MATERIA MEDICA AND BOTANY.

A.—Senega root.—Give the botanical name, the natural order, and the habitat of the plant. Describe the drug, explain its structural characteristics, and state how it may be distinguished from *false* Senega, sometimes seen in the market. Name the principal constituents of the drug and give the percentage of the acrid principle. What are the medical properties of Senega, and in what doses is it given?

B.—Jalap.—Give the botanical name, the natural order, and the habitat of the plant. Describe the drug and explain its structure. What percentage of resin should it contain? State the behavior of this resin to simple solvents, and to chemical solvents. How would you distinguish it from the resins of *false* Jalaps? Give the medicinal dose of Jalap and of the resin.

C.—Broom.—Give the pharmacopœial name of the drug; also the botanical name, the natural order, the habitat, and the officinal part of the plant. Describe the drug, and give its medical properties, and its dose. What important principles does it contain?

D.—Mezereon.—Name the plant or plants yielding it; also the natural order, and the habitat. Describe the physical characters of the drug, and its structure. What constituents have been obtained from it? Which of the constituents is acrid? Give the medical properties of the drug, and its dose.

E.—Staranise.—Name the plant and the natural order, the habitat, and the part used. Describe the drug, stating also the relative weight of its different parts, and the proportion of volatile oil yielded by these parts. Name some other drugs or plants, yielding volatile oils chemically identical with that of staranise.

F.—Flaxseed.—Name the plant, and the natural order. Give a description of the drug, and explain its structural characteristics. Name its important

medical constituents, and state the location of each in the tissues. In what percentage is one of the principles obtained by cold and hot pressure?

G.—Lupulin.—What is lupulin? Name the plant, and the part of the plant yielding it. Describe its physical properties, and its structure. Name its important constituents, and explain the change taking place on exposure. Give the medical properties of lupulin, and its dose.

H.—Lactucarium.—Name the plant and its natural order from which lactucarium is obtained. How is lactucarium procured? What are its physical properties? State the effect of simple solvents upon it, and give the percentage soluble in diluted alcohol. Name its bitter and other important constituents. What effect has alkali upon lactucarium? State the medical properties, and the dose.

I.—Papaveraceæ.—Name the plants of this order, yielding officinal drugs, and give the parts used; also, the most important constituents of each, a characteristic property or reaction of each constituent named, and the medicinal dose of each drug.

K.—Adulterations.—Describe the processes by which you would detect the following adulterations: 1., Oil of sassafras in oil of gaultheria; 2., Gum arabic in opium; 3., Starch in gamboge; 4., Salicin in quinine; 5., Rosin in resin of scammony.

THEORY AND PRACTICE OF PHARMACY.

A.—1.—What is the specific gravity of the officinal liquid of which one fluidounce weighs 478.03 + grains?

2.—What is the liquid, and what is its specific volume?

3.—How many fluidounces of the liquid are there in a kilogramme?

4.—How many grains of the liquid are there in a cubic-centimetre?

B.—Give the unabbreviated officinal names, ingredients, brief outlines of process and describe the appearance of *Solution of Chlorinated Soda, Fluid Extract of Indian Cannabis, Aromatic Wine, Compound Tincture of Cinchona Basham's Mixture, Infusion of Digitalis, Compound Extract of Colocynth, and Vinegar of Opium.*

C.—Give the English names, ingredients, brief outlines of process, and describe the appearance of *Abstractum Jalapæ, Ceratum Sabinæ, Tinctura Nucis Vomicæ, Emplastrum Belladonnæ, Infusum Sennæ Compositum, Confectio Sennæ, Mistura Chloroformi, and Pyroxylinum.*

D.—Give the officinal ingredients and quantities used in making one pound Avoirdupois, each of *Dover's Powder, Oleate of Mercury and Tincture of Iodine.*

E.—Define the term, *vinous fermentation*, name the substances which must be present, and state the conditions requisite for the successful preparation of *wine.* Describe the various stages in the process for making *malt* and name the ferment which is active in the formation of malt. What does good *extract of malt* consist of, and what is its most valuable constituent?

F.—What are the officinal tests for the identity of *Sulphate of Quinine?* Explain the action of the officinal test (Kerner's) for impurities in Sulphate of Quinine. What impurities is this test designed to detect? What is the smallest percentage of these impurities that it is expected to discover?

G.—What are *Compressed Pills?* Draw a sketch or describe in words a form of apparatus, which may be used in making them upon a small scale, give a description of a machine for making them upon a large scale, what are the advantages and disadvantages attending the use of these pills.

H.—Describe a process for making *Gelatin Capsules* to contain liquids. How may they be filled and sealed? How are empty capsules which are intended to hold solids made? Describe a form of apparatus used for filling them with powders.

I.—1.—Write out a prescription for a four-ounce solution having a teaspoonful dose which shall contain 2 grains of a soluble iron salt, with a suitable tonic tincture.

2—Write out a prescription for a four-ounce solution in proper proportion for a teaspoonful dose for adults which shall contain chloroform and elixir of orange.

3—Write out a metric prescription of approved form for twenty pills, each containing the equivalent of 1-60th of a grain of strychnine and 2 grains of sulphate of quinine.

K.—Examine the following prescriptions and if you would dispense them, state the proper method and the quantity of finished preparation in each case.

℞

Potass. Permang..... gr. xij
Fiant Pil. No. xxiv.

Sig.—One, three times a day.

℞

Ext. Lupulini Fluid..... ƒ℥ ss
Acid. Hydrobrom. Dil..... ƒ℥ ij
Aquæ Menth. Pip. q. s. ft..... ƒ℥ vi

Sig.—A teaspoonful three times a day.

℞

Acid. Hydroc..... mxxx
Potass. Chlor..... grlx
Aquæ ad..... ƒ℥ ij

Sig.—A teaspoonful as directed.

℞

Chloralhydratis..... ℥ i
Camphoræ..... gr. lxiv
Misce. fiat pulv. et div. in Chart. No. xii.

Sig.—One powder at night.

For Mrs. Brown.

℞

Syr. Ferri Iodidi.
Liq. Potass. Arsen..... aaƒ℥ ij
Syr. Tolu. ad..... ƒ℥ iij

Sig.—A teaspoonful three times a day.

CHEMISTRY.

A.—Describe the metal *Copper*. State what are some of its important alloys and give their composition. Give the formulas of the officinal Salts of Copper.

B.—Give the chemical formulas of and describe *Hydrargyri Chloridum Corrosivum* and *Hydrargyri Chloridum Mite*. State what are the points of difference between *Hydrargyri Oxidum Rubrum* and *Hydrargyri Oxidum Flavum*. Give the chemical formulas of *Hydrargyri Subsulphas Flavus* and *Hydrargyrum Ammoniatum*.

C.—Describe the metal *Aluminum*. What are valuable properties possessed by this metal? How is Aluminum prepared? Mention any improved processes lately proposed or tried. Are any useful alloys known in the composition of which Aluminum enters.

D.—What are the several commercial varieties of the metal *Iron*? Give the physical and chemical differences of these varieties. To which of these varieties does the officinal Ferrum belong? What is the composition of Ferrum reductum and by what process is it made?

E.—State what are the tests relied upon for the detection of *Arsenic* poisoning. Give a brief description of the methods of procedure in applying these tests. How would you prepare by an officinal process an antidote to arsenic poisoning?

F.—What is an *Ether?* What is the distinction between a *simple* and a *compound Ether*? Give the chemical formula and state to which class Aether belongs. Give the chemical formula and state to which class Aether aceticus belongs. Give the chemical formula and state to which the nitrous ether of spiritus aetheris nitrosi belongs.

G.—What is *Fermentation?* Enumerate the several kinds of fermentation and write the chemical reactions for the changes that take place. What are some of the industries based upon fermentation processes? Name some officinal compounds that are products of fermentation?

H.—What is the chemical formula of *Acidum Benzoicum?* Give the sources of preparation of this acid, both natural and artificial. Give the formulas of the *alcohol* and *aldehyde* corresponding to this acid. Are either of these officinal and under what name or names?

I.—What is the difference between a *Phenol*, an *Aromatic Alcohol*, an *Alcohol-Phenol*, an *Aromatic-Acid* and a *Phenol-Acid*? Illustrate by an example of each class.

K.—What is the chemical composition of most of the *essential oils?* In what physical and chemical points do they differ from the *fixed oils?* What is a *Camphor?* What is the general chemical composition of the *Resins?* What of the *Balsams?*

EXAMINING COMMITTEE.

A.—What substances are used in the officinal process for *Diluted Hydrocyanic Acid?* State briefly the method of its preparation. Give the percentage strength of this Acid. State the process for its extemporaneous preparation. What reaction takes place during this process? How should the Acid be preserved?

B.—Give the officinal definition for *Chinoidin*. Name its principal active chemical constituents. Describe its physical properties. What are its best solvents? Is it reliable as a remedial agent? How is it generally administered?

C.—What is the *unit of capacity* in the metric system? How is it obtained from the meter? What is the metric *unit of weight?* How is it obtained? Express the weight of 1000 cc. of officinal *Glycerin*, *Nitric Acid*, and *Benzin*, according to the metric system.

D.—Give three tests for detecting Salts of *Ammonium*, and state how Salts of *Potassium* would interfere with these. Describe four tests for recognizing *Nitrates*. By what *chemical tests* would you distinguish *Potassium Nitrate* from *Potassium Chlorate?*

E.—What is *Argols?* How is it produced? What is the difference in color of the commercial article due to? What are the chemical constituents of Argols? How is it purified? What is the name of the purified product? What *acid* is obtained from it? Give the process for obtaining this Acid. What impurity is generally present?

F.—How long would it take to empty a vessel containing a gallon of officinal Alcohol at the rate of 2989.392 grains per second? How many grains of water will be required to add to a gallon of Alcohol, to make diluted Alcohol?

G.—Name the additional ingredients with weight of each necessary to add to one pound of Powdered Licorice Root, to make *Compound Licorice Powder.* State the mode of preparation, and give its officinal title.

H.—Name the ingredients which enter into the composition of *Compound Tincture of Benzoin.* Give the *botanical name, natural order, habitat,* and *officinal portion* of the plants yielding the constituents thereof.

I.—1. Should the two following prescriptions be prepared as written? How would you proceed?

℞

Tr. Tolu	ʃ ʒ i
Liq. Morph. Sulph.	ʃ ʒ iij

M. ft. Mist. Secund. Art.

Sig.—Half-teaspoonful as directed for cough.

2.

℞

Quin. Sulph.	gr. xxxii
Tr. Ferri Chlor.	
Spt. Ammon. Arom	aa ʃ ʒ iij
Aquæ Font.	ʃ ʒ xiv

M. ft. Solutio.

Sig.—A teaspoonful 3 times a day.

3. Give your method of procedure in full for the preparation and dispensing of the following recipe:

℞

Ol. Terebinth	ʃ ʒ ss
Pulv. Acaciæ.	
Sacch. Alb.	aa ʒ iij
Quin. Sulph.	gr. xxxii
Aq. Menth. Pip.	q. s. ft. ʃ ʒ iv

M. ft. Mist. Sec. Art.

Sig.—A teaspoonful every fourth hour. C.

K.—1.

Potass. Iodid.	ʒ ij
Ammon Iodid.	ʒ i
Hydrarg. Chlor. Corros.	gr. j
Syr. Sarsap. Co.	

M. ft. Mist.

Sig.—"Hg Cl. 1-32." Teaspoonful 3 times daily in water. P. C. P.

How would you dispense this prescription? Write a label for it in the blank furnished, numbering it 5001.

2. Would you dispense the following prescriptions? Give reasons for your action in each case.

℞

Tr. Ferri Chlor.	ʃ ʒ iv
Strychninæ	gr. jss
Syr. Aurant Cort.	
Aquæ	aa ʃ ʒ ij

M ft. Mist.

Sig.—"For Mr. Parrish." A teaspoonfull 3 times a day in a wineglass of water. R.

3.

Acid. Sulphuric	ʃ ʒ ij
Syr. Prunl Virg.	ʃ ʒ xiv

M. ft. Mist.

Sig.—Teaspoonful 3 times a day.

SPECIMENS.

Materica Medica.	*Pharmacy.*	*Chemistry.*	*Committee.*
Ipecacuanha.	Cinchoninæ sulph.	Sulphur præcip.	Colchici semen.
Leptandra.	Pulv. Glycyrr. comp.	Sodii bicarb.	Cetraria.
Guaiaci lign.	Oleum Adipis.	Sodii hyposulph.	Oleum sassafras.
Prunus virg.	Tinct. Opii deodor.	Calx chlorata.	Ol. Theobromæ.
Stramonii fol.	Ferri sulph. præc.	Alumen.	Podophyllum.
Santonica.	Liq. Ferri tersulph.	Acid. aceticum.	Syr. Ferri iodidi.
Piper.	Linim. Chloroformi.	Acid. salicylic.	Acid. sulphuros.
Sinapis alba.	Extr. Sarsap. comp. fl.	Acid. tannicum.	Potass. bicarb.
Terebinthina.	Extr. Pruni virg. fl.	Benzinum.	Ferri Sulphas.
Aloe capensis.	Aqua Fœniculi.	Amylum.	Spir. Æther. nitr.

OPERATIVE PHARMACY.

1.

Put up a prescription, *secundum artem* each teaspoonful dose of which shall contain five minims each of tincture of guaiac and spirit of nitrous ether with sufficient water to make three fluidounces. *Write upon a separate label the contents of the bottle and attach it.*

2.

℞. Ext. Coloc. Comp. gr. xxiv.
Abstract. Jalapæ gr. xviii.
Hydrarg.Chlor.Mit. gr. xviii.
Cambogiæ Pulv. gr. iv.
Make eighteen pills.

3.

℞. Ext. Stramonii,
Acidi Tannici ää gr. iii.
Ol. Theobromæ gr. c.
Make six suppositories by rolling, without moulds.

4.

Mercury 240 grs.
Lard and Suet 240 grs.
MercurialOintment 20 grs.
Compound Tinct. Benzoin 30 drops.
Make officinal mercurial ointment.

5.

Spread a Soap Plaster 4x6.

The examination in *Analytical Chemistry* comprised the qualitative determination of from four to six salts of mineral and organic origin.

Twelve members of the graduating class, having attained the grade "very satisfactory" in the examination in materica medica, including specimens, were entitled to the competitive examination of microscopic specimens of drugs for the John M. Maisch prize. Of the nine candidates present, Mr. E. R. Stitt recognized the largest number, nine out of the following twelve: Apocynum cannabinum, Stillingia, Senega, Triticum repens, Aspidium, Frangula, Cinchona Calisaya (flat), Conii fructus, Nux vomica, Lycopodium, Kamala, Arnicæ radix.

Thirty-five candidates, who passed the examination, had not fully complied with all the requirements; their names will be subsequently reported to the Board of Trustees. 148 candidates were recommended for the degree of Graduate in Pharmacy (Ph. G.); their names, with the titles of their essays are as follows:

Paul Bucher Anspach, Pennsylvania, Acetate of Sodium.
Charles Butterworth Ashton, Pennsylvania, Sublimation.
Jacob Michael Baer, Pennsylvania, Liquid Extract of Malt.
William Louis Baum, Illinois, Polariscope.
Addison Lloyd Beck, Pennsylvania, Ricinus communis.
Warren B. Beckler, Maine, Glycerin.
Emile Seraphine Bernardy, Pennsylvania, Camphora.
Ellsworth Smith Beshore, Pennsylvania, Cypripedium parviflorum.
Samuel Walter Bishop, New Jersey, Improvements in Pharmacy.
George Davis Blomer, Jr., Pennsylvania, Glue.
Charles Scott Bondurant, Missouri, Tussilago Farfara.
Charles Ducharme Boyd, Pennsylvania, Arsenic and arsenical poisoning.
Irvin Jacob Brandt, Pennsylvania, Syrupus Sarsaparillæ compositus.
Edgar Breneiser, Pennsylvania, Mitchella repens.
Frederick Kendall Brown, Delaware, Catalpa bignonioides.
William MacGilvray Buchholz, Pennsylvania, Hydrastis.

Alfred Gray Burk, New Jersey, Cocaine.
Robert Jump Burton, Delaware, Syrup of Wild Cherry.
Orlin Ulysses Cassaday, Ohio, Chromates of the Cinchona Alkaloids.
Charles Wesley Christ, Pennsylvania, Plants and their uses.
Harry Gerheart Comp, Pennsylvania, Erythroxylon Coca.
John Wesley Cotterel, Pennsylvania, Elixirs.
William Monroe Clarkson Craine, Pennsylvania, Unguentum Hydrargyri.
Orville Sharpe Creighton, Ohio, Ferrum reductum.
Lewis Aylesworth Crull, Pennsylvania, Digitalis purpurea.
Oscar Fingal Dana, Jr., Maine, Eupatorium perfoliatum.
Eugene De Reeves, Texas, Extract of Wild Cherry Bark.
Frank William Droelle, Michigan, Gaultheria procumbens.
Howard Samuel Eckels, Pennsylvania, Sulphuric acid.
William McKee Elden, Pennsylvania, Text Books of Pharmacy.
Henry Everett Emerson, Pennsylvania, Residue of Tincture of Myrrh.
Addison Henry English, New Jersey, Syrups by cold percolation.
George A. Ennis, Delaware, Latin in Prescriptions.
Edwin Reed Falloure, West Virginia, Pancreatic ferments.
John Kirk Faust, Pennsylvania, Tincture of Vanilla.
James Adams Ferguson, Pennsylvania, Aristolochia recticulata.
Daniel Webster Fetterrolf, Pennsylvania, Adulterations of Arsenious Oxide.
Ira Elmer Finfrock, Ohio, Incompatibilities.
Robert Welles Fisher, Delaware, Influence of sun-light on Iodine.
Jonas Hezekiah Garman, Pennsylvania, Most important constituents of vegetable substances.
Amandus George Georges, New York, Camphor and Chloral.
Albert Frederick Graf, Pennsylvania, Goulard's Cerate with cosmoline.
John Lincoln Grayson, Pennsylvania, Vanilla.
William Grebe, Pennsylvania, Urinalysis.
Frederick Hamilton Green, Iowa, Alchemy.
P. Nettleton Guise, Ohio, Helianthemum canadense.
Henry James Hackett, Pennsylvania, Digest of the Pharmacopœia.
Edward John Hadfield, Kansas, Mercury and its preparations.
Henry Haglin, Arkansas, Creasote.
John Frederick Hamill, Pennsylvania, Pharmacy.
William Lincoln Hartzell, Pennsylvania, Oleum Morrhuæ.
Thomas Wesley Harrison, Pennsylvania, Triturationes.
William Finley Hassenplug, Pennsylvania, Adulteration of Opium.
Andrew Jackson Heberling, Pennsylvania, Officinal Salicylates.
Ralph Christian Herrmann, Pennsylvania, Erythroxylon Coca.
Howard Huyett Hettinger, Pennsylvania, Rhubarb.
Edmund Gilbert High, Pennsylvania, Plumbum.
John Franklin Hildebrand, Pennsylvania, Olive Oil and adulterations.
Charles Benjamin Hildreth, Ohio, Pepsinum.
Arlington Grove Horine, Maryland, Thea.
Kaspar Hœrner, Texas, Antimonii et Potassii Tartras.
William Henry Hostley, Pennsylvania, Cimicifuga.
Tod Howard, Ohio, Myrrha.
Joseph Emil Huber, Illinois, Purification of Amylic Alcohol.

Howard D. Huntsman, Pennsylvania, Lanolin.
Henry Havelock Johnstone, Canada, Extemporaneous Chlorine Water.
Frank Peter Keck, Pennsylvania, Volatile Oils.
John Keiffer, Ohio, Hamamelis.
Charles Kelchner, Pennsylvania, Zincum.
Charles Emery Keller, Pennsylvania, Potassii Bicarbonas.
Elmer Augustus Klapp, Pennsylvania, Chlorophyll.
Jacob Glaes Kooker, Pennsylvania, Belladonna.
Charles Krebs, Ohio, Spiritus Aetheris ferratus.
Oscar Julius Lache, Pennsylvania, Rhus glabrum.
Richard Henry Lackey, Pennsylvania, Mercury.
John Joseph Lantz, Pennsylvania, California Wines.
Carl Daniel Latterner, Illinois, Ulmas fulva.
Joseph Frank Lehr, Pennsylvania, Extractum Carnis.
Paul Leuschner, Michigan, The Linnæan System.
John Nathan Grier Long, Pennsylvania, Medicinal Oleates.
John Ligget Longshore, Ohio, Rhus Toxicodendron.
Anna Lord, Delaware, Sulphuric acid.
Samuel Steen Loughridge, Pennsylvania, Syrup of Hydriodic acid.
John Thomas McClanahan, Texas, Cotton.
Henry McDavit, New Jersey, Reduced Iron Pills.
Charles William McKean, Ohio, Mercuric Oxide.
Joseph McKee, Pennsylvania, Asclepias Curassavica.
Charles Henry Martin, Kentucky, Stillingia sylvatica.
Jesse Claude Marquardt, Ohio, Officinal Alcohol.
Henry Snyder Mauger, Pennsylvania, Grapes.
Frank D. Mawhinney, Pennsylvania, Assay of Opium.
Albert Henry Mayer, Pennsylvania, Aluminum.
Caswell Armstrong Mayo, Mississippi, Purity of Alcohol.
Samuel Stansbury Mell, Pennsylvania, Gymnocladus canadensis.
Harry Edgar Mickey, Ohio, Oleum Gaultheriæ and Betula lenta.
James A. Miller, Pennsylvania, Unguentum Zinci Oxidi.
Thomas James Moffett, Indiana, Pharmaceutic manipulations.
William Ervin Moyer, Pennsylvania, Ferrum.
Harry Kendall Mulford, New Jersey, Pepsin, etc.
Levi Allen Neiman, Pennsylvania, Rhamnus Purshiana.
William Heisley Nelson, Pennsylvania, Fluid Extract of Ergot.
Otto Christian Neumeister, Wisconsin, Mercurous iodide.
Samuel Byron Ousey, Pennsylvania, Nicotiana Tabacum.
Elmer Outten, Pennsylvania, Pharmacy.
William Arky Partee, Tennesee, Phytolaccæ radix.
John George Patton, Ohio, Petrolatum.
Edward Pennock, Pennsylvania, Scutellaria.
David Augustus Peters, Pennsylvania, Ergota.
Pinckney Napoleon Pinchback, Louisiana, Chlorine.
William David Porter, Pennsylvania, Adonis vernalis.
Charles Rehfuss, Ohio, Mentha piperita and its preparations.
Charles Wesley Rinedoller, Pennsylvania, Subiodide of Bismuth.

George Parson Ringler, Pennsylvania, Mucilage and Syrup of Acacia.
Norman Gruver Ritter, Pennsylvania, Adeps.
Livingston Everett Rixstine, Pennsylvania, Conduct of the Drug Business.
John Patterson Ross, Pennsylvania, Infusions and Decoctions.
Charles Selmar Rottner, Pennsylvania, Salicylic acid.
William Henry Saurer, Pennsylvania, Ceratum Plumbi subacetatis.
Edward Francis Schneider, Ohio, Emulsions.
Thomas La Blanc Schofield, Pennsylvania, Petrolatum.
William Notson Seary, Pennsylvania, Carbolic Acid.
Edward Grant Seibert, Pennsylvania, Polygonatum biflorum.
Charles Albert Seither, Pennsylvania, Permanganate of Potash Pills.
Franklin Philip Shaak, Pennsylvania, Syrup of Cranberries.
Ellery Best Shoemaker, Pennsylvania, Acidum Arseniosum.
Robert Edwin Lee Simmons, North Carolina, Diospyros virginiana.
John Virgil Slaughter, New Jersey, Abstracts.
Pharis Edwin Smith, Pennsylvania, Syrupus Ipecacuanhæ et Opii.
Walter Adam Smith, Pennsylvania, Ilex opaca.
Willard Eugene Smith, Delaware, Lycopodium clavatum.
Oscar Alfred Sprissler, Pennsylvania, Polytrichum juniperinum.
Gustave Steinmann, Wisconsin, Bitter principle of Leptandra.
Edward Rhodes Stitt, North Carolina, Caffeine.
William Henry Sutton, Ireland, Erythroxylon.
John Derr Suydam, Pennsylvania, Pyrethrum.
Bennett Lewis Taylor, Ohio, Irritant Poisons.
Jay Chester Vanscoter, New York, Educated Pharmacists.
George Lewis Wagner, Pennsylvania, Menthol.
Gustavus Adolphus Weckler, Wisconsin, Lappa officinalis.
Robert Fruit Welliver, Pennsylvania, Eriodictyon glutinosum.
Frederick William Weidmayer, Ohio, Hydrastis canadensis.
Reinhold Charles Werner, Wisconsin, Linseed oil.
Heston Whitney, New Jersey, Xanthoxylon fraxineum.
George Henry Wilkinson, New Jersey, Barium.
Benjamin A. Wissler, Pennsylvania, Tobacco.
George Washington Wolfersberger, Pennsylvania, Pills and pill excipients.
Robert Taylor Young, Pennsylvania, Scaled salts of iron.
Albert Theodore Zeller, New York, Stillingia.

A certificate of proficiency in chemistry was recommended to be awarded to Phil. Steiner Clarkson, of New Jersey.

The faculty invited the successful candidates, and the officers and trustees of the College to a reunion in the museum of the College building on the evening of March 16th, when a few hours were spent in pleasant intercourse. On this occasion the class presented to Prof. Maisch a handsome mantle-clock, to Prof. Remington a convenient easy-chair, and to Mr. Moerk, the assistant of the chair of chemistry, a number of valuable books.

On the evening of Friday, March 18th, the commencement exercises were held in the Academy of Music, when the degree of Graduate in Pharmacy was conferred upon the above-named candidates by the President of the College, Charles Bullock, and subsequently the degree of Master in Pharmacy—*honoris*

causa—upon Alfred B. Taylor of Philadelphia, class 1844; Wm. B. Webb of Philadelphia, class 1845; Chas. A. Heinitsh of Lancaster, the first President of the Pennsylvania Pharmaceutical Association; Prof. Wm. T. Wenzell of San Francisco, class 1855; and Prof. C. Lewis Diehl of Louisville, class 1862. The Procter medal was presented by President Bullock to O. U. Cassaday and C. S. Bondurant, and honorable mention was awarded to A. L. Beck, E. S. Beshore, C. B. Hildreth and W. A. Partee with the grade, "distinguished," and to E. Breneiser, F. W. Droelle, J. E. Huber, O. C. Neumeister, J. G. Patton and E. R. Shoemaker, with the grade, "meritorious." The H. C. Lea prize, $100, for most meritorious work in connection with the thesis, was equally divided between A. L. Beck and E. G. Seibert. The latter received also the Materia Medica prize, a Zentmayer microscope for the histological examination of an American plant; and the former took, in addition, the Chemistry prize, an analytical balance, for original quantitative analysis. In connection with this prize, the work done by J. A. Ferguson, C. S. Bondurant, F. W. Droelle, E. S. Beshore and E. Breneiser was honorably commended. The Pharmacy prize, a gold medal, for original pharmaceutical work was presented to E. Breneiser, with honorable mention of E. J. Hadfield and W. V. Smith. The Analytical Chemistry prize, $25, was awarded to E. S. Beshore, and honorable mention to C. S. Bondurant. E. R. Stitt received the J. M. Maisch prize offered by Mr. J. H. Redsecker, $20, for histological knowledge of drugs; J. G. Patton, the Operative Pharmacy prize, offered by E. L. Boggs, $25, for best examination in that branch; and A. L. Beck, the Theoretical Pharmacy prize, offered by Mr. H. J. Maris, a prescription balance. Honorable mention was accorded in connection with the Maisch prize to E. S. Beshore, C. S. Bonduraut, C. D. Boyd, O. U. Cassaday, J. A. Ferguson, C. B. Hildreth, A. H. Mayer, W. A. Partee, E. G. Seibert, E. B. Shoemaker and G. Steinmann; in connection with the two Pharmacy prizes to C. S. Bondurant, E. Breneiser, O. U. Cassaday, F. W. Droelle, C. B. Hildreth and B. L. Taylor for the former, and to E. Breneiser, C. L. Bondurant and O. U. Cassaday for the latter.

In the valedictory address, Professor Remington gave some very interesting statistics in relation to the number of graduates thus far sent forth by all the colleges of pharmacy in the United States since their existence, and the proportion of graduates to the total number of proprietors, which is about 1 to 10½, and to the total number of proprietors and assistants, which is 1 to over 15. Prof. Remington also feelingly alluded to the decease, during examination time, of two senior students, Wm. D. Brooks of Memphis, Tenn., and Wm. G. Tittle of Harrisburg, Pa. The exercises were opened and interspersed with music, and closed with the distribution of floral and other gifts to many of the graduates. As in the preceding year, it was noticed that this custom of publicly bestowing such presents is on the decline, and it is to be hoped that before long it will be entirely abrogated, as has been done by several medical colleges in Philadelphia.

The Alumni Association of the Philadelphia College of Pharmacy held its twenty-third annual meeting in the College building, March 17th. The President, Wallace Procter, dwelled in his annual address on the necessity of a good general education of those intending to follow pharmacy as a pursuit, and urged the members to not consider the applications for positions in their stores,

unless the applicants were qualified for entering upon further studies, such qualification to be determined by the apprentice examination established by the College (see AM. JOUR. PHAR., 1886, p. 410 and 573). The President also recommended the continuance of the special committee appointed for the purpose of co-operating with the College towards the erection of a building on Tenth street for the accommodation of the library and museum, and for other purposes of the College.

The Secretary, Wm. E. Krewson, reported that the membership had increased during the past seven years from 480 to over 1200; during the last year 14 deaths had been reported. The social meetings of the Alumni Association, of which five were held during the course just closed, had been well attended.

The Treasurer, Edward C. Jones, reported the total receipts during the year to have been $1.87[illegible]9, the present balance being $138.32.

The following officers were elected for the ensuing year: David W. Ross, class 1877, president; Clement B. Lowe, class 1884, and Dr. B. Frank Scholl, class 1882, vice presidents; Wm. E. Krewson, class 1869, recording secretary; Wm. N. Stem, class 1873, corresponding secretary; Wallace Procter, Jos. W. England and Prof. Henry Trimble (for unexpired term) executive board; Thos. S. Wiegand, class 1844, trustee of sinking fund, and Josiah K. Lilly, class 1882, orator for 1888, with Dr. H. Fisher, class 1877, as alternate.

The reception to the graduating class was held the same evening at the hall of the Academy of Fine Arts, which was crowded on the occasion. The exercises consisted of an address by President Procter, the awarding of the certificates of membership and of the alumni prizes; an oration by Thos. D. McElhenie, class 1872, of Brooklyn, N. Y.; the class oration by Walter A. Smith of Philadelphia, on "Unity;" the class history by Edward J. Hadfield of Dodge, Kan., and an address on the future of the class by the class prophet, Wm. C. Hepler of Reading, Pa. The gold medal was awarded to O. U. Cassaday of Alliance, O.; the quiz master's silver medal to E. S. Beshore of Bethel, Pa.; certificates for proficiency shown in examination to W. A. Partee of Nashville, Tenn., in materia medica; A. L. Beck of Sharon, Pa., in pharmacy; Chas. S. Bondurant of St. Louis, Mo., in chemistry; E. Breneiser of Reading, Pa., in general pharmacy; J. G. Patton of Youngstown, O., in operative pharmacy; F. W. Droelle of Detroit, Mich., in analytical chemistry, and B. L. Taylor of Janesville, O., in specimens. Certificates were also awarded to Paul Leuschner of Detroit, for a very creditable collection of plants, and to Wm. Crutcher of Nicholasville, Ky., for the best junior examination. Twenty students and graduates who were members of the class in microscopy under the direction of A. P. Brown, Ph.G., and who had successfully passed the examination in that branch, received testimonial certificates.

The exercises of the evening were enlivened by songs from the College Glee Club—a novel feature, which deserves to be continued by future classes, if the requisite material, suitable voices, should be available.

Cincinnati College of Pharmacy.—The Commencement Exercises of the College were held at College Hall on the evening of the 17th of March. Addresses were made by President George Merrell, Hon. J. D. Cox, president of the University of Cincinnati, and by Prof. J. F. Judge, on behalf of the faculty of the College. The degree of Graduate in Pharmacy was conferred by President Merrell on the following graduates.

W. M. Bloss, Ceredo, W. Va.
L. J. Feid, Cincinnati, O.
Ernst H. Gierach, Cincinnati.
Edward W. Gray, New Vienna, O.
Jos. W. Hall, Ironton, O.
W. A. Hardy, Lebanon, O.
Winfield S. Heister, Springfield, O.
James Kennedy, Carlisle, Ky.
F. H. King, Delphos, O.
C. A. Kipp, Greenville, O.
Herman H. Koegels, Newport, Ky.
Louis F. Kolb, Paducah, Ky.
Herman Lohmann, Cincinnati, O.
Herman Oechsners, New Orleans, La.
Mrs. Kate A. Platts, Bellevue, Ky.
Edwin B. Tuteur, La Crosse, Wis.
Archer D. Tyson, Middletown, O.
Alb. D. Wells, Cincinnati, O.
A. O. Zwick, Covington, Ky.

Prizes were awarded as follows: H. H. Koegels, gold medal for proficiency in theoretical pharmacy, by Prof. Lloyd; E. B. Tuteur, gold medal for best examination in practical pharmacy, by Prof. Fennel; J. W. Hall, microscope for proficiency in materia medica and microscopic determination of specimens, by Prof. Coblentz; E. H. Gierach, gold medal for proficiency in chemistry, by Prof. Judge; A. O. Zwick, gold medal for best general examination by the Board of Trustees. F. W. Blesi, of the junior class, received the silver medal for best examination in botany, by Prof. James, and also the silver medal for best junior examination offered by the Board of Trustees.

After the close of the exercises the "Class Supper, was partaken of at the St. Nicholas, and was a very enjoyable affair.

Maryland College of Pharmacy.—The thirty-fifth annual commencement was held in the Academy of Music, Baltimore, on the evening of March 23d, when President Roberts conferred the degree of Graduate in Pharmacy upon the following 34 candidates:

Charles D. Allee.
Charles Arendt.
Claude M. Badgley.
G. H. Beckley.
J. Henry Blass.
Morris Binswanger.
C. L. Dohme.
J. H. Emmett.
Henry Fehsenfeld.
Wm. D. Hohmann.
H. S. Hambleton.
Caspar F. Jones.
H. E. Kelly.
J. Louis Krick.
John C. Krantz.
Wm. Frank Lucas.
N. C. Mules.
C. H. Michael.
Harry G. Murphy.
W. N. Owings.
A. A. Quandt.
E. E. Quandt.
Robert G. Reese.
Howard Schindel.
Henry A. Schmidt.
Wm. C. Shelton.
C. Urban Smith.
Martin H. Smith.
William J. Smith.
A. Showman.
John L. Porr.
Frank H. Waite.
A. Fuller Whiteside.
G. Howard Willett.

Five gold medals were awarded for examinations to R. G. Reese, W. J. Smith, and G. H. Willett; for analytical work to E. E. Quandt, and in practical pharmacy to M. H. Smith. The recipient of the junior class gold medal was W. L. C. Palmer. The valedictory address on behalf of the graduates was delivered by C. M. Badgley.

The New York College of Pharmacy held its 57th annual commencement in Steinway Hall on the evening of March 29th. The degree of Pharmacy was conferred upon 81 candidates, and two received certificates in chemistry and materia medica. The college prizes were awarded by vice-president Menninger, and the Alumni prizes by B. F. Hays, president of the Alumni Association. Addresses were made by the President of the College E. Mc Intyre, by I. M. Foster of the graduating class, and by Rev. R. Collyer, D.D.

Summer Courses in Colleges of Pharmacy.—The California College of Pharmacy gives its regular course of instruction always during the summer months, the next commencing April 4th. In the Universities of Michigan and Wisconsin the instruction in pharmacy is continued for several months after the regular courses of lectures have terminated in the other colleges. But the Chicago College of Pharmacy, as well as the Illinois College of Pharmacy, have made arrangements for two sessions annually, one during the winter, and the second during the spring, terminating early in summer. In most of the remaining colleges of pharmacy auxiliary courses, which are not obligatory, are carried on outside of the regular sessions. Thus at the Philadelphia College the chemical laboratory will be open during the greater part of the year, and the course in practical botany, inaugurated twenty years ago, will again be continued during the coming summer, the organization of the botany class taking place on April 13, at 4 P. M.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Yearbook of Pharmacy, comprising abstracts of papers relating to pharmacy, materia medica and chemistry, contributed to British and foreign journals from July 1st, 1885, to June 30, 1886. With the Transactions of the British Pharmaceutical Conference at the twenty-third annual meeting held at Birmingham, September, 1886. London: J. & A. Churchill. 8vo, pp. 606.

This welcome annual was received in February. A little more than one-half of it (346 pages) comprises the yearbook, which is designed to be a collection of abstracts of papers having pharmaceutical interest, and which were published during the preceding year; it covers the same ground as the Report on the Progress of Pharmacy in the Proceedings of the American Pharmaceutical Association. Nearly 200 pages are required for the minutes of the Conference and for the papers read at its last annual meeting. Like its predecessors the volume is quite valuable as an epitome of the pharmaceutical work done during the year.

The Principles of Pharmacognosy, an Introduction to the Study of the Crude Substances of the Vegetable Kingdom. By Friedrich A. Flückiger, Ph.D., M.D., Professor in the University at Strassburg, and Alexander Tschirch, Ph.D., Lecturer on Botany and Pharmacognosy in the University of Berlin. Translated from the second and completely revised German edition by Frederick B. Power, Ph.D., Professor of Materia Medica and Pharmacy in the University of Wisconsin. William Wood & Co., New York, 1887. 8 vo, pp. 310. Price, $3.

Some time ago we announced that Professor Power was engaged in preparing a translation of Flückiger and Tschirch's "Grundlagen der Pharmacognosie," and we are pleased to announce now that the English version of this valuable work is before us. Having previously spoken in detail of the scope, arrangement and execution of the work, it remains now mainly to state, that the translation has been well done, and while the original text is closely followed, the English rendition does not suffer in clearness and precision. We may, therefore, in regard to the work before us repeat what we

stated on the appearance of the second German edition, that the subject matter of the work, the lucid and attractive manner of its treatment, the literary references, and the handsome illustrations, 186 in number, all combine to make the work a most valuable one for the study of vegetable histology, preliminary to that of materia medica.

Proceedings of the Michigan State Pharmaceutical Association at its fourth annual meeting, held in the city of Grand Rapids, October 12, 13 and 14, 1886; also the constitution and by-laws, roll of members, &c. Detroit: D. O. Haynes & Co. 8vo, pp. 237.

A brief account of this meeting was published on page 18 of our December number. Among other valuable papers it contains one by Prof. Prescott, entitled "Outline of a Plan of Study of Assistants in Pharmacy;" a reprint of this paper has also been received.

A Plea for Legitimate Pharmacy versus Proprietary Articles partaking of the Character of Nostrums; with a compilation of formulæ for remedies prescribed by physicians and lists of simple remedies. By Emlen Painter, Ph.G. 8vo, pp. 35.

The author is earnest in his plea concerning a subject which has been frequently discussed in this Journal in the past. A number of factors have been operative in producing the continually increasing proprietary articles; one of these factors must be looked for in the indifference of many apothecaries and their want of pride in preparations of their own make, even simple pharmacopœial galenicals, through which course the laboratory of the pharmacist has been reduced in extent, and that of the manufacturer more increased.

Manuel des Étudiants en Pharmacie. Par Ludovic Jammes, pharmacien de 1re classe, médecin. Paris: J. B. Baillière et Fils, 1886. 12mo, pp. 475 and 768.

Manual for Students in Pharmacy.

The two volumes before us give an interesting picture of the educational course prescribed by law for pharmacists in France. The first volume opens with the decrees, decisions and regulations relating to the studies and the examinations of pharmacists. There are two classes of pharmacists; those of the first class may settle in the large cities, but those of the second class only in certain districts. Yet the requirements for the two classes are very similar—three years apprenticeship in a store, and examination in practical pharmacy and practical botany, and subsequently three years studies at a pharmaceutical school; they differ mainly in the preliminary education required, and in the extent of the final examinations. To become a pharmacist of the first class, the aspirant is required to produce, when entering as apprentice and when matriculating at the school of pharmacy, the diploma of bachelor of arts or bachelor of sciences; of others either the grammar school certificate, or the certificate of proficiency in the first stage tow-

ards the bachelorship in arts is required. The studies at the school comprise lectures and laboratory work during the whole three years, and an examination must be passed at the end of each year in the branches taught, namely in organic chemistry, chemical analysis, toxicology, physics, pharmacy, materia medica, mineralogy, hydrology, botany and zoology.

All these subjects except systematic chemistry, physics and zoology are included in the two volumes referred to above; and they are arranged in the following order: Chemical analysis with the well-known scheme for the separation and recognition of the metallic elements occupies 74 pages. The reactions of the most prominent alkaloids are given; also the means for recognizing the inorganic and the more common organic acids, and the behavior of the various substances before the blowpipe. This is followed by toxicology, which chapter, comprising 114 pages, is mainly devoted to the chemical processes for the detection of poisons; the toxic doses and antidotes are also mentioned, and attention is drawn to the necessity of searching for vegetable and animal fragments in case the poisoning occurred through poisonous plants or through cantharides.

The last 240 pages of the first volume are devoted to "Pharmacy," and treat of pharmaceutical operations and pharmaceutical preparations. The latter are arranged under medicaments for internal use and for external use, and the former are again divided into such prepared by solution in water, alcohol, ether, wine, vinegar and beer, or by distillation, evaporation and in other various ways. This part of the book contains the formulas for all the galenical preparations of the new French Codex.

The second volume opens with a chapter on the microscope and its uses, including the preparation of objects, staining, preservation, measuring, chemical testing, etc. It is primarily intended as an introduction to the next chapter on vegetable histology, in which the formation of cells, the various tissues and the anatomical structure of roots, stems and leaves are considered. Under organography, the various organs of nutrition and of reproduction are described and their functions explained. Next follows systematic botany, with the orders arranged principally according to De Candolle; the botanical descriptions are brief, the most striking characteristics being pointed out, except in the case of medicinal plants indigenous to France, which are described somewhat more minutely.

After the brief discussion of some geological questions and the explanation of crystallography, mineralogy is taken up, the minerals being concisely described according to composition, crystalline form, density, hardness, fracture and other physical properties, and their uses are indicated.

The chapter on hydrology treats of water in its various forms, including mineral waters and their analysis, and it is followed by the "Natural History of Simple Drugs." The arrangement of the animal and vegetable drugs is according to their origin, so that in the latter case we have a repetition of the botanical classification in another part of the same volume, but no botanical descriptions, the drugs themselves being briefly described, together with their important constituents and their uses.

The two volumes embrace the subjects of the first and second years examinations of the French pharmaceutical student, and in their necessarily condensed form are well adapted for reviewing the studies covering such a large field. There are about 270 good illustrations, most of them being useful for explaining the subjects in connection with which they have been used.

Hand Book of Materia Medica, Pharmacy and Therapeutics, including the physiological action of drugs, the special therapeutics of disease, official and extemporaneous pharmacy, and minute directions for prescription writing. By S. O. L. Potter, M.A., M.D., Professor of the Theory and Practice of Medicine in the Cooper Medical College of San Francisco, etc. Philadelphia: P. Blackiston, Son & Co. 1887. 8vo, pp. 628. Price $3.

This work has been written for the use of physicians, and will doubtless prove of value owing to its condensed form and the general correctness of the statements relating to physiological action and therapeutic application. The first part contains upon nearly 400 pages an enumeration of pharmacopœial and other drugs arranged in alphabetical order, giving under each head the Latin and English names, the derivation, and a brief description, usually condensed from the Pharmacopœia, the most striking characters being preferably given; these are followed by the constituents, the preparations, physiological action and therapeutics. It is particularly in the constituents that quite a number of inaccuracies occur. Jalapin is said (p.350) to be probably identical with convolvulin, which is insoluble in ether, and the ether soluble resin of jalap is called jalapin (p. 238) although it is re-precipitated from its alkali solution by acids. Oil of juniper, a hydrocarbon, is stated (p. 240) to consist of terpenes and camphors; kamala is said to contain starch; the terpene valerene of oil of valerian (p. 384) to be produced by oxidation; olive oil (p. 273) to contain the stearopten palmitin; the crystalline lactucerin (p. 244) to resemble caoutchouc, etc. The first part closes with a well-written chapter on the classification of medicines.

The second part is on pharmacy and prescription writing. The pharmaceutical operations, the different classes of pharmacopœial preparations, and weights and measures are briefly explained, followed by a chapter on prescriptions, in which a great deal of good advice is given, notably in the paragraphs on prescription writing and prescription blanks. The succeeding paragraph on renewals opens well, but a few lines further on the author enters upon the war-path against the "average druggist," and finally pictures the good results for the pockets of the patient and of the physician, and the loss to their "enemies," if the physician was to carry a small stock of ready-made medicines. The second part concludes with the consideration of incompatibles and of the various forms of extemporaneous preparations.

Part III is devoted to special therapeutics, the diseases being considered in alphabetical order; and an appendix contains a list of Latin words and phrases, genitive case endings, various formulas, treatment of poisoning, differential diagnosis, clinical examination of urine, and other useful information. A carefully prepared index facilitates the use of the book.

Pocket Medical Formulary arranged therapeutically. By A. Hazard, M.D., and B. M. Goldberg, M.D. Revised and enlarged by A. S. Gerhard, A.M., M.D., Professor of General Pathology, Medical Jurisprudence and Clinical Medicine at the Medico-Chirurgical College, Philadelphia. With an Appendix containing formulas and doses of hypodermic medication, a table of eruptive fevers and poisons, their symptoms, antidotes and treatment. Philadelphia. Collins, printer, 1886. 16mo, pp. 334. Price, $2.

The title of this little book fully explains its scope. Eleven hundred formulas are given, a large number being by prominent American physicians, and each is credited to its author. The arrangement is alphabetical, on a therapeutic basis, and by the use of the patent index all references are readily made. With each letter a number of blank leaves have been bound for the recording of additional formulas. The book is bound in flexible morocco, and being conveniently carried in the pocket, is always readily accessible to the practitioner.

Conklin's Handy Manual of Useful Information. Compiled by Prof. G. W. Conklin of the Hamilton University, Chicago. G. W. Ogilvie. 24mo, pp. 316. Price, 25 cents.

It contains a large number of statistics, and in a condensed form a great deal of information on all kinds of subjects.

Karl Theodor Mohr. Eine Biographische Skizze mit Einleitung, Aphorismen zur Geschichte der Pharmacie.

This reprint from the February number of the Pharmaceutische Rundschau, New York, contains a biographical sketch of Mr. Chas. T. Mohr of Mobile, Ala., whose explorations of the flora, more especially of the Southwestern states, have made him favorably known at home and abroad. The introduction, Aphorisms to the History of Pharmacy, is from the pen of the editor, Dr. F. Hoffmann.

Die Untersuchungs Anstalten für Nahrungs- und Genussmittel sowie Gebrauchs-Gegenstände, deren Organisation und Wirkungskreis. Referat von Herrn Professor Dr. Albert Hilger (Erlangen). Braunschweig. Fr. Vieweg & Sohn, 1887. 8vo, pp. 26.

This pamphlet is a reprint from the German Quarterly Journal of Public Hygiene, and contains the transactions of the German Society for public hygiene in relation to a report made by Prof. Hilger on the organization and sphere of action of public institutions for the examination of articles of food, drink and general use.

Twenty-eighth Annual Report of the Inspector of Milk and Vinegar for the year 1886. Boston, 1887. 8vo, pp. 63.

The report is by Prof. Jas. F. Babcock, who acted as chemist for the department of inspection for a number of years, until he was placed at its head.

Record of Experiments at Fort Scott, Kansas, in the manufacture of sugar from sorghum and sugar-canes in 1886. By H. W. Wiley, chemist. Washington, 1887. 8mo, pp. 64.

This is Bulletin No. 14, of the U. S. Department of Agriculture, Division of Chemistry.

Ueber den Nachweis des Cocains im Thierkörper. Von Leonhard Hemsing. Dorpat 1886. Pp. 39.

On the detection of cocaine in the animal body.

Étherification de l'acide sulphurique dans l'eau de Rabel. Par Théophile Gautrand. Montpellier, 1787. Pp. 48.

Etherification of sulphuric acid in Rabel's water (alcohol and sulphuric acid, 3 : 1).

Papaina sua accao physiologica e therapeutica. Por Domingos Alberto Niobey. Rio de Janeiro, 1887. Pp. 92.

Papain, its physiological action and therapeutics.

We hope to prepare abstracts of the above three theses for a future number of the journal.

The Doctorate Address at the semi-centennial anniversary of the University of Louisville, Medical Department, March 2, 1887. By Professor David W. Yandell, M. D. 8vo, pp. 16.

Valedictory Address, Medical Department, University of California. By Professor A. L. Lengfeld, M. D. 8vo, pp. 12.

The Increased Efficacy of Massage, in combination with the electro-vapor bath. By F. E. Stewart, M. D., Ph.G.

Reprint from the *Medical Register.*

Sterility. Management of the Secundines. By Prof. W. A. Wathen, M. D., Louisville.

Report on Diseases of the Rectum. By Prof. Jos. M. Matthews, M. D., Louisville.

The reception of the above reprints is acknowledged.

The Source of the Mississippi. 4vo, pp. 16.

This interesting pamphlet is a reprint from "Science" of December 24, 1886, and contains a letter from Messrs. Ivison, Blakeman, Taylor & Co., (the publishers of *Science*) and the report of Hopewell Clarke, Chief of the I., B., T. & Co. expedition to the headwaters of the Mississippi, October 1886.

The Connoisseur. Illustrated quarterly of art and decoration. Published by Bailey, Banks & Biddle, Philadelphia. Price 50 cents a year.

An interesting and instructive periodical for lovers of art, containing instructive papers on various subjects and a large number of finely executed illustrations.